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IMPORTANT NOTICE

Circumstances connected with the war have made it advisable to change the place of the next Annual Meeting of the American Public Health Association from New Orleans to Washington, D. C.

The dates of meeting have been tentatively advanced to Oct. 17—20, 1917.

Further announcements will be made in the September issue of the Journal, and will also be mailed to members.

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SANITATION IN SOME CANADIAN BARRACKS AND CAMPS.

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and
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Chief Officer of Health, Ontario.

THE following information is the result of some three years' experience as sanitary officers of the largest military district in Canada. It embraces an account of the general and personal sanitation of large bodies of men and both improvised winter quarters and summer camps. It is gratifying to the writers to be able to say that, while there were many cases of one and another form of communicable diseases, considering the large number of men involved, no serious epidemic occurred. In the first two winters there were sharp outbreaks of cerebrospinal fever, which prompt measures kept under control. These will be referred to at a greater length in another part of this article. We were singularly free from typhoid fever, thanks to general precautionary measures, and particularly to the care of the water supply and inoculation.

GENERAL SANITATION.

BARRACKS.—The barracks used for Canadian soldiers were mostly improvised buildings otherwise used as schools or for exhibition purposes. In some cases armories were used. Most of these buildings were large enough for the accommodation of an entire battalion, between 1,000 and 1,100 men. Smaller buildings to quarter 30 to 50 men would be much better, particularly in case of an outbreak of communicable disease.

Ventilation.—In barracks, careful attention was directed to ventilation, and endeavor made to provide at least 400 cubic feet of air space for each man. When possible, windows were left open during the night, and at intervals of an hour, the doors were opened for five minutes by the quarter-guard.

Heating.—In the barracks during winter, heat was maintained by whatever happened to be the readiest plan available. In some, large coal stoves were used; in others, hot water heating, previously in existence in the building, was maintained.

Bunks.—The bunks were of wood, double-decked, usually creosoted, and

built to accommodate eight men. They were raised ten inches to one foot from the floor so as to readily allow of sweeping underneath. Straw palliasses were used during the first winter of the war, but were abandoned thereafter, because they were liable to leave dirt and litter.

Floors.—In the cleaning of quarters no dry sweeping was allowed. The floors were first sprinkled with 1-40 strength of the following standard solution:

1. Crude carbolic.
2. Soft soap,
3. Water.

Latrines, Ablution Tables and Baths.—The latrines in barracks were practically all of the flush type. There was ample water, both hot and cold, for ablution and bathing purposes. In order that these places should be maintained in strict sanitary condition, a special sanitary detail was constantly on duty in the day time. In some cases tin basins were used by the men, and these, when not in use, were kept in a 1-40 strength of the standard solution already referred to.

Care of Dishes and Kitchen Utensils.—As a protection against infection, all dishes and table-and kitchen-utensils were required to be subjected to *boiling* for at least five minutes after each meal. For this purpose galvanized iron tubs, each containing an inner tub perforated with numerous inch-in-diameter openings and capable of holding 100 pint mugs, or their equivalent of dishes, were provided. The water in these was heated by setting the tubs on gas plates. Four tubs and six containers were provided for each battalion (about 1,100 men) the extra containers being filled with dishes ready to be placed in the tub of boiling water when another was completed. This is to avoid delay. The heavy container was placed and removed by a block and pulley or by two men. The dishes were dried on racks.

Latrines.—Latrines in camps consisted of strongly built huts, accommodating eight men at a time. Metal bucket containers were used. The contents of these and of the urine tubs which were placed in an adjacent enclosure were removed by a contractor to a distance of a couple of miles, twice a day. The buckets were placed under a hinged seat in the huts. The openings over the buckets were closed by a lid which automatically shut as the seats were vacated, thus preventing the excreta being reached by flies. While the doors of the huts and ventilators were arranged to close automatically, it was not found practicable to keep them closed in hot weather. Each battalion was allowed six latrine huts accommodating forty-eight men at a time. Accommodation in the same proportion, about 5 per cent., was provided for the officers.

The huts were so arranged that the buckets could be removed by raising the top of the seat or through a hinged door at the back. The latter is a poor arrangement, as the door, being outside, swells with the wet and soon refuses to close properly, thereby allowing the admission of flies. On removal of the contents, the buckets were swabbed with the carbolic soap solution, and both in the excreta and urine buckets a small quantity of the solu-

tion was left at each time of emptying. The latrine hut floors and seats were scrubbed each morning with the same solution.

On the March.—Short and shallow trenches 1′ x 1′ x 3′ were used for excreta and urine on the march, each man being required to cover his excreta with dry earth. All areas were required to be left as found by the troops. Manure, garbage and rubbish were burned.

Quarters in Camps.—Tents were rolled every morning and, except in wet weather, blankets were placed outside during the day time. In case tent floors were used, these were washed every day with the carbolic-soap solution and twice a week taken out and left in the sun for several hours. Every three weeks the tents were struck for one-half a day, the floors removed and the area under them exposed to the air and sunlight.

Strict regulations were in force prohibiting the use of food in tents and no scattering of litter and rubbish was permitted.

Water Supply.—At one of the camps the ultra-violet ray (R-U-V type of machine), following treatment by a roughing sand filter, was used to purify the water. While this gave satisfactory results, it proved to be an expensive method, and we have arrived at the conclusion that the most practical method of water purification in camps where this is necessary is the use of hypochlorite of lime. It is simple, cheap, and most efficient.

All wells or other sources of supply on the line of march were examined by the laboratory unit and only those allowed to be used which were found safe. It was found that the large majority of wells and springs in well settled country districts were contaminated, probably from surface pollution.

Garbage.—Garbage was kept in covered cans in a screened enclosure and removed twice a day. In another camp the garbage and camp litter were burned in metal incinerators constructed for the purpose. As there are about 500 pounds of combustible material in each unit of 1,100 men, the burning of garbage and litter is quite feasible. Indeed, manure may also be readily destroyed in this way, but in an agricultural community where it may be utilized to advantage, it is a waste to burn manure. Non-combustible material such as tin cans, bottles, wire, etc., were removed to some distance from the camp, sprayed with crude oil, and burned. This not only reduces their bulk, but destroys any remnants of their contents. Bones were placed in securely covered barrels and removed by a contractor who purchased them from the Militia Department.

Incinerators.—Many types of incinerators were devised, such as the well-known saucer-shaped one of stone, brick or sods with a center cone for ventilation: the oblong one of brick, cement or stone; the circular one constructed of sods about a cask or barrel, etc. The important point about any type is that a good fire be maintained constantly.

In one camp metal incinerators were installed. Some units, by an ingenious arrangement of coils, made

use of the heat therefrom to boil water for use in sterilizing dishes, heating bath water, etc.

Blankets.—All blankets in use were sterilized by steam at intervals of two or three weeks, facilities being provided whereby 3,000 or 4,000 blankets could be subjected to live steam for from twenty minutes to half an hour at a time. The blankets were dried by shutting off the steam and exposing them to dry heat for five minutes.

The arrangements for the sterilization of blankets were briefly as follows: An airtight chamber or chambers were constructed. Half-inch perforated steam pipes to allow exit of live steam were placed along the sides. Other steam pipes for drying purposes were placed nearer bottom of the chamber walls. These pipes were connected up with a steam boiler. Steam-cocks were adjusted to control the operation of moist or dry heat as desired. Pressure and temperature gauges were attached. Cross rods were supplied upon which the blankets were hung.

The whole apparatus was constructed at very reasonable cost and proved most effective.

Personal Sanitation.

Baths.—Ample bathing facilities were provided. In winter both hot and cold water showers were available. Foot troughs were also provided. In the summer camps there were cold showers only. At Niagara and Camp Borden the adjacent lake and river were used for regular bathing parades.

Boots and Care of the Feet.—The officers, non-commissioned officers and men received instruction in this subject and paid a great deal of attention to boots. The medical officer or his representative, as well as the quartermaster, were present at each issue of boots in order to see that the men were suitably fitted. The medical officer made a personal examination of each man's boots and kept a record of them. If complaint was made by any man about his shoes, the difficulty was sought, and by means of exchanges and frequent inspection, much disability from ill-fitting and unsuitable shoes was prevented. Men were advised to keep their feet scrupulously clean, to keep their socks in good condition, to turn and dry them after a march and to harden the feet by cold ablution and the use of alum solution after a march. Foot troughs were provided so that ample means for foot-washing were available. Blisters and abrasions were given careful attention, and corns and bunions alleviated at the earliest moment. Blisters were opened with a valve-like opening, and then painted with iodine.

Men's Clothing.—The men's clothing was sterilized in the steam plant. This was found to be satisfactory, except that the leather collars required to be removed, as the steam destroyed them.

In cases where the clothing was infected with vermin, a useful measure was found to be that of immersing them in gasoline. Immersion of one or two minutes was found to be sufficient to destroy the vermin and the eggs as well.

Communicable Diseases.

In the great wars of the past, plagues have been responsible for more deaths among troops than have any acts of the enemy; so every care has been taken to protect enlisted men from communicable diseases. The disorders caused by the contamination of food and water with alvine discharges containing germs responsible for the production of intestinal diseases, have in recent wars wrought great havoc. Typhoid and paratyphoid fevers, and dysentery, did more damage in the Boer War and Spanish American War than any act of the enemy. In earlier wars, smallpox was one of the greatest scourges.

In Canada all troops were vaccinated against smallpox. This was compulsory, and unless a man had been vaccinated within the previous few months, he was vaccinated or revaccinated.

Inoculation and Vaccination.—Typhoid inoculation alone was in use up to May, 1916, when mixed vaccine began to be used. The technique consisted in the use of a 10 cc. sterilized syringe and separate needle for each man. Immediately below the collarbone an area about one inch in diameter was painted with tincture of iodine, and the injection made subcutaneously. The first and second doses contained 500 million of mixed dead bacteria, and the third 1,000 million. The injections were given at intervals of seven days, and vaccination was done on the day preceding the last injection, so that the entire process was completed in two weeks. Men were not required to do any heavy duty such as marching, for the next twenty-four hours. While there was a moderate reaction in the majority of cases, evidenced by slight headache, malaise, slight chills, etc., comparatively few cases showed any marked disability and there has in no case resulted any permanent ill-result. Very few cases went to hospital; the longest hospital period in any case for this cause did not exceed forty-eight hours. All the typhoid and mixed vaccine used by Canadian troops has been supplied gratuitously by the Laboratories of the Provincial Board of Health of the Province of Ontario. The smallpox vaccine used has been chiefly that prepared by the Antitoxin Laboratory of the University of Toronto. Considering that typhoid fever is endemic all over Canada, it is a remarkable tribute to the sanitary care of our troops that during the year 1916, there were but 167 cases of typhoid fever among the thousands of men concentrated in the country.

Inoculation and vaccination parades in this military district were regarded as of the utmost importance from both the military and medical viewpoint. They took precedence over all other parades and over all military training. Such parades were arranged for as soon as possible after a new unit was organized. Furthermore, it was found advantageous to have all inoculations and vaccinations carried out by the officers of one special unit. For this purpose in Medical Division No. 2, the Divisional Laboratory Unit was utilized. This unit consisted of several medical officers, usually four, two or

three non-commissioned officers and a couple of men. Through the Assistant Director of Medical Service and General Staff Officer they arranged the inoculation and vaccination parades with the commanding officer of the unit. It was considered very desirable to have the entire unit paraded at the time, with band, if the unit possessed a band. Furthermore, the moral effect was excellent, if the band played during the time the inoculations and vaccinations were being done. Also it was found that when all officers, including the commissioned officers, were inoculated or vaccinated with the men of the unit, the commissioned officers coming up first, the example was of value. The men saw that everyone was playing the game.

No other protective inoculations of a voluntary or compulsory sort were carried out. During an outbreak of epidemic cerebrospinal meningitis the question of voluntary inoculation was considered, but it was not felt that such a procedure was of sufficient value to warrant its introduction until further evidence was forthcoming to demonstrate the desirability of so doing.

Laboratory Unit.—The laboratory unit, in addition to being responsible for the inoculations and vaccinations, carried on the routine work of a public health laboratory and also of a hospital clinical laboratory. This included the control of water supplies in summer camps, by means of bacteriological and chemical examinations. Such examinations were of course supplemented by surveys made by the sanitary officers of the district. Routine examinations of throat cultures for B. diphtheriæ, blood for Widal test, blood for Wassermann reaction, sputa for B. tuberculosis, smears for gonococci, urinalyses, investigation of gastric contents, and blood counts were made. The Laboratory unit was found to be of the very greatest service in the control of epidemic cerebrospinal meningitis. Officers of this unit, in addition to the sanitary officers, were competent to do lumbar punctures and administer anti-meningitis serum. This was considered especially necessary since the success in treatment so often depended upon early recognition and vigorous treatment as soon as the case was discovered. If necessary, an officer of the laboratory unit could, in coöperation with one of the sanitary officers, direct the entire treatment of the case, if the patient happened to be in billets or in a civilian hospital in a country district. The examination of cerebrospinal fluid from suspected cases and the examination of the swabs from the naso-pharynx of all patients and contacts was also carried out by the laboratory unit.

Since cooks, mess orderlies and kitchen fatigues are especially liable to transmit infection if they happen to be carriers, all such were paraded twice for naso-pharyngeal swabs, each fall when the troops went into winter quarters. Furthermore, it was especially emphasized that, as far as possible, mess orderlies and kitchen fatigues should not be changed too frequently. Two successive negative naso-pharyngeal swabs for meningococci were demanded in the case of

all cooks, mess orderlies and men in kitchen fatigue. This, in combination with the sterilization of all dishes after each meal and the isolation of all immediate contacts when a case of epidemic meningitis occurred, were believed to be all that was necessary.

Meningococcus meningitis was observed both in its epidemic and sporadic forms. During the first few months of the war sixteen epidemic cases were seen and there were eight deaths. With the establishment of adequate measures of control, in the following year and a half, there were sixteen cases in the district with only two deaths.

Too much emphasis cannot be placed upon the necessity of having all medical officers on the lookout for cases of meningitis. Conferences were held, the most recent knowledge of disease was discussed by those familiar with it, precautions to be taken were outlined, and real team-work between medical officers of all units, officers of the laboratory unit and the sanitary officers arranged. Early recognition, prompt action, and careful supervision eliminates this disease, or at least completely minimizes its significance. Unless, however, medical officers are especially careful, cases will be overlooked, and entire units will be quarantined and military training seriously disturbed.

One other aspect of the question of meningitis is worthy of mention. In order that the serum used in the treatment of the cases of the disease be as effective as possible, cultures from every case were placed at the disposal of the University of Toronto, where the serum is prepared, in order that such cultures might be used in the immunization of the horses. A serum then was available covering all strains isolated from cases in the district. This plan undoubtedly insured a serum as satisfactory for treatment as it is possible to obtain at present. The horses producing the serum were also immunized with all the strains of meningococci in the collection of the Rockefeller Institute. This was possible through the courtesy and kindness of Doctor Flexner and Doctor Amoss.

Pneumonia.—Another important problem among transmissible diseases was that of lobar pneumonia. All such cases should be reported, isolated and treated as communicable. The laboratory unit undertook to determine the type of organism in order that serum treatment might be tried if cases due to type I organism were found. The casualties from lobar pneumonia among troops in training will be very considerable unless special care is taken. The problem of open cases of tuberculosis is not a serious one among enlisted men, if the medical officers responsible for the examination of recruits do their full duty, and if men are carefully reëxamined by medical boards two or three times before being allowed to proceed over seas.

Venereal Diseases.—One of the gravest problems remains to be dealt with, namely, that of venereal diseases. At the outset, it may be stated that a specialist Venereal Officer for the Military District was appointed and this meant that more effective co-operation was possible than could other-

wise have been the case. The duties of this officer were to supervise treatment in the venereal section of the Base Hospital, to act with the Assistant Director of Medical Service and sanitary officers in carrying out all measures to control syphilis and gonorrhoea. Lectures to men, pamphlets, and all educational means elsewhere found to be of value, were used. The supervision of venereal parades, and of venereal prophylaxis were also duties of this officer. By carefully noting the rate of admissions from different units and by frequent conferences, much good was accomplished. There is still much that can be done in the control of these diseases but no single measure is, in the opinion of the writers, as important as the appointment of a venereal officer, whose duty it is to correlate prevention and treatment, to have a general oversight over the whole situation in the district in the matter of venereal diseases. This will, of course, include the closest possible coöperation with civilian authorities, as indeed should be the case with all communicable diseases so far mentioned. All cases of the ordinary communicable diseases, measles, mumps, scarlet fever, whooping-cough, etc., were treated in an isolation department of the Base Hospital. While troops were in barracks in a large center or population, daily reports were received from the local department of health with a list of all cases of communicable disease reported during the previous twenty-four hours with the street address, indicating where the case was being treated. Such addresses were then out of bounds for all troops, until the end of the quarantine period in each instance.

DIPHTHERIA.—A recent epidemic outbreak of wound diphtheria amongst returned men has been observed This was of considerable interest and is being reported more fully elsewhere (*Journal of the American Medical Association*). The outbreak was limited to returned men and it was found that these were suffering from diphtheritic infection when they landed in Canada from overseas. The usual methods for the control of diphtheria were found to be effective in checking the outbreak.

In a general way the control of communicable diseases amongst troops is often a more simple problem than the control of the same diseases in the civilian population. Education of all ranks, especially the non-commissioned officers in regard to the principal facts with regard to the way in which communicable diseases are spread is of the greatest importance. Also frequent conferences of medical officers of all units and sanitary officers, with the Assistant Director of Medical Service should be arranged at frequent intervals for the discussion of all sanitary questions. If this is done, a very much better understanding is arrived at and coöperation is effected which would otherwise be impossible. Of all the measures, after specific prophylaxis, education is the most significant.

In conclusion the writers may be permitted to quote a few sentences from the Cavendish Lecture by an officer of the Canadian Army Medical Corps, in London, during last month:

"The Medical Service, above all

other services, has done its perfect work. It has yielded an army without sickness. I have never seen a case of typhoid, and the few infectious cases are of the nature of children's diseases —measles, mumps, chicken-pox. For the first time, also, in the history of the world we have an army which is free from venereal disease."

"The Medical Service is no longer the poor relation of the army. By the miracle it has performed of keeping the army fit, the consideration accorded to the service is unbounded. New problems face it every day, problems that must be solved. Trench feet in the first and second winters were likely to cripple the army. Last winter the methods of prevention were so sure that a case of trench foot was a curiosity and brought stoppage of leave upon a battalion which produced them. Medical officers may not command; they advise. But he would be a rash commanding officer who would disregard advice repeatedly given."

THE FALLACY OF READING ACCURATELY GAS PERCENTAGES IN THE FERMENTATION OF LACTOSE PEPTONE BILE AND LACTOSE BROTH.

WILLIAM W. BROWNE,
The College of the City of New York.

THE use of lactose broth and lactose peptone bile as a "presumptive test" has been used most extensively during the last decade in the detection of the Bacillus coli group in the bacteriological examination of water, oysters, milk, and sewage effluents. It is a common practice to read gas productions in the fermentation and inverted vials very accurately sometimes to the fractional part of a unit, thus

33⅓ per cent.—B. coli group.
62 per cent.—B. coli group.
74 per cent.—B. coli group.

Of what values are the numbers, especially the fractions, to the left of the equal sign? From the data presented in this paper it was found that:

1. The following factors cause variations in the amounts of gas produced in lactose peptone bile and lactose broth:

a. Temperature.
b. Time of incubation.
c. Initial reaction of the culture medium.
d. Length of inverted vial.
e. Source of bile.
f. Absorption of formed gas.

2. The amount of gas produced in percentages varies in a given group within a wide range.

Since all these factors and possibly many other uncontrollable ones play a very important part in the final gas readings, which must necessarily vary considerably and since no real quantitative value can be assigned to any observation of gas production, it seems that accurate readings of gas percentages have no scientific justification in sanitary bacteriological analyses and that gas readings could be recorded just as conveniently and more scientifically by the positive (+) and negative (−) signs respectively.

GASOLINE ENGINE EXHAUST-GAS POISONING.

DR. R. P. ALBAUGH,
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THE gasoline motor and the poorly ventilated garage have brought with them instances of prostration and even death induced by intoxication from noxious gases emitted as exhaust gases from gasoline engines. Whenever an explosion is of moderate intensity and combustion incomplete, these gases may be formed in amounts far in excess of the amounts we have learned to consider the physiological standards of endurance. Burrell, Schumacher, Apelbach, and others, have shown by analyses that the per cent. of carbon monoxid in exhaust gases varies from 2 to 25—averaging about 9 per cent.—while that of carbon dioxid varies from 3 to 24 per cent., both depending upon the quality of carburation and the bore and stroke of the engine. Haldane states that .05 per cent. carbon monoxid in pure air is just sufficient to produce in time very slight symptoms of poisoning in man; that 0.1 per cent. may cause a slight headache or palpitation of the heart in an hour or less; and that 0.2 per cent. is very dangerous. Burrell found in experiments upon himself that he became very sick for eight hours after exposure for twenty minutes to air containing 0.25 per cent. carbon monoxid. It is evident that great dilution of these gases must be brought about in order to render them harmless.

The Ohio State Department of Health has received a number of complaints and reports of exhaust gas intoxications, and in most instances investigations of these occurrences have been made by members of the department. In one instance a man whose son was employed in the engine testing department of an automobile factory complained that his son and three other young men had suffered from dizziness and extreme weakness at various times, and on one occasion were forced to be taken from the room, at which time they were seized with severe attacks of vomiting, together with vertigo, ringing in the ears, headache, general weakness and a slow, weak pulse. They were taken into the open air and gradually recovered and were able to return to work the second day thereafter. A number of cases of sudden death have also been reported, occurring, in most instances, in small private garages with windows and doors tightly closed. The term "petromortis" has been frequently used by the press as the cause of death in cases of this kind.

Probably the most striking instance of exhaust gas poisoning called to our attention occurred in a hotel in a small town in Western Ohio. The building was a two-story structure with a private electric plant, consisting of a generator and a 14 h. p. gasoline engine located in a small room in the basement. From the engine a three-inch exhaust pipe led out underground into an alley to a silencing drum made of two twenty-four-inch sewer tiles. From this drum the three-inch pipe continued and came to the surface about twenty feet from the building.

The engine was operated by the night clerk, who usually went to the engine room two or three times in an evening to see that oil cups were filled and everything running smoothly, and at twelve o'clock nightly he stopped the engine and closed the building. On the occasion of one visit to the engine room, he was seized with extreme dizziness and a great general weakness, especially noticeable in the lower extremities, and was forced to sit down and rest several times on the steps leading from the basement. He immediately sought the open air and in the course of half an hour had fully recovered. This same condition was repeated to a greater or less degree each time he visited the basement during the next few nights, and becoming alarmed about his condition he consulted a physician, who assured him that he had no heart affection or other organic trouble in so far as he was able to discover. About two weeks after he first noticed his trouble, he went to the engine room at twelve o'clock, as usual, and stopped the engine. While in the basement he became so dizzy that he could not stand and was forced to crawl on his hands and knees to the first floor. In attempting to ascend the first flight of stairs leading to the second floor, he became so dizzy, weak and short of breath, and a throbbing headache became so severe that he called for help and promptly lost consciousness. There were nineteen other persons in the hotel and as they came into the corridor (all on the second floor), they also became so weak and dizzy that they were forced to either sit or lie down. One man was able to reach a telephone and summon a physician, who decided that they had eaten poisoned food, and accordingly administered warm milk and other emetics, and later a large dose of epsom salts. All complained of practically the same symptoms, viz., dizziness, general muscular weakness, throbbing temporal headache, palpitation, and shortness of breath. Two were in a comatose condition, four complained of nausea, while in two instances there were evidences of relaxation of the sphincters. Although some were rather indisposed for a day or two, all recovered in a short time.

The following day an investigation was made of the cause of the wholesale poisoning. The gasoline engine was started and the five persons present in the engine room were conscious of dizziness, weakness and palpitation within a few minutes after the engine was started. The exhaust pipe was dug up and it was found that one sewer tile had given away and the silencing drum was almost completely filled with water and dirt. With an almost total occlusion of the exhaust pipe, practically the whole charge of gas was forced back into the small, poorly ventilated basement room, from which it found its way through the open stair door to the entire building.

Carbon monoxid, of course, was responsible for these cases of intoxication as it is for all cases of exhaust-gas poisoning. Being lighter than air, it permeated the building rapidly when the door was opened and reached the second floor in such concentration as to be poisonous in a very few seconds,

notwithstanding the dilution that necessarily took place as the gas traveled through the three rooms on the first floor. Carbon monoxid is in no way a new poison, but the advent of the gasoline engine as a means of power and locomotion brings with it many curious opportunities for its poisonous effects.

The first consideration in the prevention of poisoning by gases emitted from the engine is adequate dilution. Authorities have agreed that the concentration of carbon monoxid in pure air must be kept below .05 per cent. if poisoning is to be prevented. Thus, if an ordinary gasoline motor running at moderate speed is capable of emitting 2.5 cubic feet of carbon monoxid per minute, approximately 1,500 cubic feet of pure air per minute would be required to keep the concentration below the danger mark. Gasoline engine manufacturers, motorists and others should keep this in mind in considering the question of ventilation of workrooms, garages, etc. The fact that cases have been reported to us of prostration in large factory rooms in automobile factories, would indicate that the danger is not confined to small garages, and the need of a thorough system of ventilation is evident. The odorless, colorless, and tasteless properties of the gas make unanticipated repeated exposures possible, and warrant wide recognition in the interests of hygiene.

ARMY SANITARY SERVICE CREATED.

Secretary Baker has approved an order creating a sanitary corps under the Medical Department of the Army which will include various classes of experts in sanitation, bacteriology, sanitary engineering, and men skilled in the supply, transportation, storage, etc., in connection with Medical Department work.

The following quotation from the order will be of interest:

"The officers of said corps will be provided by assigning officers of the Medical Reserve Corps thereto, or by the appointment of citizens of the United States who are found under regulations established by the Secretary of War to possess special skill in sanitation, in sanitary engineering, in bacteriology or other sciences related to sanitation and preventive medicine, or who possess other knowledge of special advantage to the Medical Department."

Red Cross. The Red Cross has dispatched to Russia a Special Commission to lay plans for carrying on relief work in Russia on a large scale. Among the members are George C. Whipple, C.-E. A. Winslow and Henry J. Horn.

—*The Tech*, July 10, 1917.

THE DE-LOUSING MEASURES OF THE SANTE FÉ RAILWAY SYSTEM.

MARK F. BOYD,
Epidemiologist, Iowa State Board of Health.

FOLLOWING the introduction of typhus fever into Fort Madison, Iowa, by a Sante Fé section hand, only seven days out of El Paso, Texas, and the exposure of several unidentified Mexican laborers at various points along the road in Iowa and Illinois to infection originally introduced by this case, the chief surgeon of the Sante Fé, Dr. J. P. Kaster of Topeka, Kansas, promptly realized the danger and stated the Sante Fé would promptly execute any measures suggested by the epidemiologist of the Iowa State Board of Health.

The problem confronting the road was a serious one. Mexicans, many of whom are constantly arriving from along the border and old Mexico, constitute the chief unskilled labor employed by the road along its entire system. Most of these are housed in bunk cars or bunk car bodies upon the railroad property. These are sometimes grossly overcrowded and are entirely lacking in bathing facilities. The lack of opportunities for bathing is in no-wise disconcerting to the Mexicans, most of whom appear to have seldom utilized their opportunities in this direction even in their native land. As a result of this neglect of personal cleanliness many are infested with both head and body lice, and thus afford a suitable soil for the propagation of typhus.

Two classes of persons are endangered by an importation of typhus into their midst (1) those who themselves are infested with body lice, and (2) those whose daily or occasional activities bring them in contact with louse infested persons. Among the American population of Iowa typhus would never spread very far under the present standards of living, as louse infestation is very rare. But those whose duties bring them in contact with a more or less louse infested group of persons are exposed to some degree of danger in the presence of the disease. In this connection physicians, nurses, policemen and jailers are especially endangered. This was the situation in Fort Madison, Iowa and at other points on the Sante Fé where unrecognized contacts existed. In Fort Madison the Mexican colony numbered about 230, and small section crews were also stationed at New Boston and Argyle, Iowa.

The contemplated campaign of louse extermination among this Mexican population considered three things: (1) the de-lousing of the persons of the Mexicans themselves, (2) the de-lousing of their clothing, bedding and other intimate personal effects, and (3) the de-lousing of their bunks in the cars occupied by them. Since the necessity for this work existed at other points along the road than Iowa, the magnitude of the task was greatly increased. It appeared therefore that

some portable equipment and system of operation must be devised which could be taken from place to place to accomplish this purpose. Time was pressing and the equipment must be such that it could be immediately constructed from materials on hand in the railroad shops, and the supplies

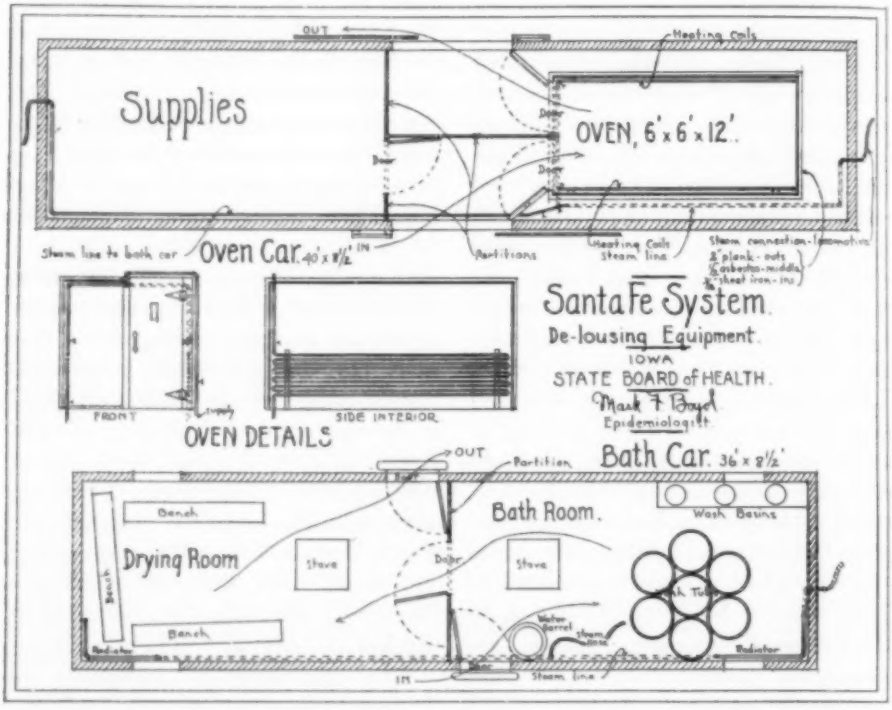

Fig. 1

those that could be drawn from those on hand in the railroad storehouse, and the help, the regular railroad employees.

It was decided to accomplish the de-lousing of the Mexicans themselves by a 10-minute bath in kerosene and soapsuds, with a kerosene and vinegar bath for the hair. Clothing, bedding, etc., was de-loused by exposure to a temperature in excess of 160° F. for twenty minutes. The sleeping quarters in the bunk cars were de-loused by spraying with kerosene. Dry heat was considered preferable for the destruction of lice in the clothing, as it could then be immediately returned to the men, hence saving time. Fumigation of the bunk cars did not seem practical, owing to their loose construction, and the length of time taken by such a process.

After the general plan of campaign was decided upon the details of construction were arranged in conference with the various officials of the Sante Fé shops at Fort Madison. Within forty-eight hours after the work of

construction was started, the equipment was ready for use.

The heating of the clothing and bedding was accomplished in a large oven (6 feet x 6 feet x 12 feet inside dimensions) constructed in one end of a 70,000 pounds capacity steel under frame freight car. The outside wall of the oven consisted of two inch planks, which on the interior was lined with one-half inch asbestos, upon which was placed three-sixteenth inch (14 gauge) sheet iron. Double doors of similar construction were provided at the end, in the middle of the car. The interior of the oven was fitted with two radiators, containing a total of 240 feet of one and one-fourth inch pipe. Each radiator had ten pipes and was placed horizontally at the bottom of each wall. The plate shows the details of construction. The opposite end of the car was partitioned off to serve as a storeroom for supplies, and a longitudinal portion was placed from the storeroom to the front of the oven, preventing crossing the car except through the oven. This installation was accomplished at a cost of about $75. Heat was to be furnished the oven by the circulation of steam from the engine, next to which this car was placed, oven first. Steam was supplied by a passenger locomotive at a pressure of from 90 to 110 pounds. Freight engines are not equipped with connections for steam heating. The oven after closure would reach a temperature of 160° F. in from 10 to 30 minutes, depending upon the external temperature, whereupon, its "run" would be considered to have commenced. At the expiration of the "run" 20 minutes later, the temperature, read through a small window, upon a thermometer suspended on the inside of the door, varied from 190° F. to 200° F. A rack was provided for mattresses, low racks for bedding and hooks were provided in the ceiling from which clothing could be hung.

Two bath cars were provided, one for men and one for women and children. In the absence of women and children the second car was also used for men. These were constructed by running a partition across a bunk car, so that two rectangular rooms were formed, each provided with an external door, opening however on opposite sides of the car. A communicating door between each room was provided. One room was designed to serve as a bath room and one as a drying room. The walls of each room and the floor of the drying room was covered with building paper. A stove was installed in each room and a radiator was also installed in each. Three benches were provided in the drying room. In the wash room a small bench was installed for the wash basins. The car was fitted with steam connections for radiation and water heating. Water was kept in a barrel inside the door and was heated by turning steam into it through a rubber hose. The bath room was supplied with seven wash tubs for bathing purposes and three wash basins. This gave accommodations for six persons. The kerosene and soapsuds (equal parts) was placed in the central tub, the men standing in the other tubs and dipping out their bath water and kerosene with sponges. The construction of both

bath cars was identical. The plan is shown in the plate previously referred to.

Since the operations were to be carried on among Mexicans most of whom understood but little English, some difficulty was apprehended because of their possible failure to understand the purpose of the work from the lack of a ready means of communication with them. It was concluded that an interpreter should accompany the train and that the de-lousing crew had best be Mexicans. This was done with the belief that after these men of the crew understood the nature of the work they could readily explain its nature to their countrymen and thus secure their intelligent coöperation. Happily the idea proved successful.

The following crew performed the work:

No. 1. Interpreter, Mexican. Explained to the occupants of a car what was to be done, later removed the contents of the oven and distributed the de-loused clothing to the naked men in the drying room of the bath car.

No. 2. Woman, Mexican. Attendant in woman's bath car. Wife of No. 1.

No. 3. Mexican. Attendant in man's bath car. It was the duty of Nos. 2 and 3 to see that all in the bath car thoroughly bathed themselves for ten minutes and washed their hair.

No. 4. Mexican, Oven attendant. Arranged the clothing and bedding loosely in the oven and carried the clothing of the occupants of the bath car from the bath car to the oven.

No. 5 and 6. Mexicans. Car delousers. Carried clothing and bedding from bunk cars to oven and sprayed kerosene onto the bunks. After delousing, the clothing and bedding was carried back to the bunk cars by the owners.

No. 7. Foreman, American.

The de-lousing crew were placed in a uniform of one-piece overalls, all the openings in which (neck, front, sides, wrists and ankles) were sealed with adhesive tape. Before sealing the wrist holes, cotton flannel gloves were pulled over the hands. The open portion of the shoes was also sealed. Rubber bathing caps were placed on the head. At the end of each day's work the crew took the de-lousing treatment themselves and their clothing was heated. A separate way car was provided for the crew in travelling.

The following equipment was requisitioned for the train:

12 galvanized iron washtubs
6 dozen sponges
1 dozen wash-basins
2 spray pumps
6 galvanized iron buckets
6 one-piece overalls, assorted sizes
1 dozen rolls adhesive tape
6 rubber bathing caps
6 pairs cotton flannel gloves, without gauntlets
2 brooms
2 mops
2 clean, empty barrels
2 one-half gallon measures
2 thermometers
6 cotton blankets
6 dozen bath towels (women)
6 dozen hand towels
Gunny sacking for floor covering

The following supplies sufficed for

the bathing of about 150 Mexicans and the de-lousing of their quarters:

2 barrels kerosene
2 gallons vinegar
3 dozen cakes of soap
2 dozen rolls paper towels.

The train was so arranged that the right hand side (looking toward the engine) was the lousy side. Bedding and clothing was taken into the oven car on the right hand side, and the Mexicans entered the bath car on the right hand side. This was called the "lousy" side of the train. After heating the bedding and clothing were removed from the left side of the oven car. After bathing the Mexicans passed into the drying room, awaited the return of their clothing and when dressed departed from the left side. This was known as the "clean" side of the train. The arrangement of the train when in operation is shown in the small sketch.

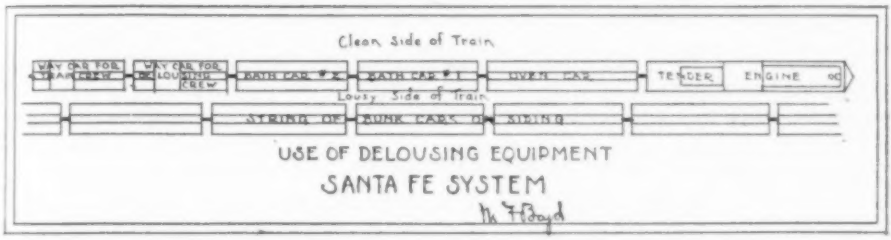

Fig. 2

The contents of each bunk car and its occupants were treated at one time. About two cars and twelve men could be handled in an hour, for each bath car.

A separate way car was provided for the train crew. The train was thus made up of five cars.

The foreman of each crew of Mexicans had them at their bunk cars when the arrival of the train was expected. They were checked off from the time book, and after bathing the name of each was recorded and a numbered de-lousing certificate issued to him. The local police kept all Mexicans off the streets who could not produce this certificate, and Sante Fé employees at other points were instructed to refuse employment to any Mexicans from Fort Madison who could not produce a certificate.

All the Mexicans gave their most active coöperation and no difficulty was experienced with any. Most seemed glad of an opportunity to take a bath, despite the dose of kerosene. After the spraying of the bunk cars all the Mexicans were warned to be careful with fire and no accidents followed its use in the bunk cars.

The Sante Fé officials have been so well satisfied with the practical nature of the equipment that four trains are now in operation, in Illinois, Iowa, Missouri and Kansas.

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PROFESSOR GUNN DEPARTS FOR FRANCE.

An Editorial by President W. A. Evans.

The American Public Health Association has been called upon to make a sacrifice in behalf of the sufferers in France. Our secretary and editor, Prof. S. M. Gunn, was asked to join the Tuberculosis Commission which the International Health Board has sent to France. The other members of this Commission are Dr. Livingston Farrand, Director, and Mr. Homer Folks, members of our Association, and Dr. J. A. Miller.

Professor Gunn's brothers have been at the front since the war began, and he has felt all along that the time would come, when he must do his bit. When he asked for a leave of absence we felt that however much his going might cripple us, if he felt it to be his duty to go, it was our duty to agree to his going.

Various members of our association have taken up duties in connection with the war for which they have been called by governments and philanthropic bodies. As the needs develop, others will go. Before the war ends I am sure a large part of our membership will have been called upon to render the services for which their training peculiarly fits them.

Professor Gunn's example will stimulate other patriotic, highly trained men to follow, but no commission will have a greater or a more humane task than this one. No task has had a better commission than this one of which our secretary is a member and our former editor is the chairman.

In the language of the heroes who go over the top, we bid them "good-bye and good luck."

We are fortunate in that Professor Gunn secured for his successor until the next annual meeting, Mr. A. W. Hedrich, who for a year has been acting as Editorial Assistant. Mr. Hedrich is active, energetic, able, and I am sure that he will have the support of the membership. *W. A. Evans.*

ANNOUNCEMENT—CHANGE OF ANNUAL MEETING.

On account of conditions engendered by the war the Executive Committee has decided to change the time and place of the Annual Meeting. When New Orleans became aware of the advantage to the country and to the Association of a meeting this fall in Washington, D. C., they readily agreed to the change on condition that we would come there when conditions in the country again became normal.

The central theme of this meeting will be the welfare of the soldier, sailor, and civilian in time of war.

The officers of each Section are asked to shape their programs so that they will bear as much as possible on the main theme. Details as to meeting, places, section headquarters, etc., will appear shortly.

The members are advised to secure their hotel accommodations in advance.

The dates of meeting are tentatively announced as October 17, 18, 19 and 20. Section heads will please notify the Acting Secretary as soon as possible of the number of sessions required, and to indicate the proposed Section programs before September 1st. *W. A. Evans.*

A NOTICE TO AUTHORS.

A number of conditions have conspired to cause an accumulation of manuscripts in the office of the JOURNAL:

The war has increased the cost of publishing, while decreasing revenues. For this reason, the Executive Committee several months ago limited the budget of the JOURNAL to such an extent that it was necessary to cut down the number of pages of reading matter to an extent noticeable to every observant reader. The war has likewise created the necessity of publishing a number of articles on this all-important subject, and these have naturally taken the place of papers read at the last annual meeting.

Finally, the advancement of the date of the annual meeting decreases the space for publication of the manuscripts on hand by two whole issues since it is imperative that the papers read at the prospective meeting at Washington, D. C., dealing with problems of the war be printed at once.

As a result of these conditions there are on hand at least four times as many manuscripts as can be published within a reasonable length of time. It is exceedingly unfortunate that the readers of the JOURNAL should be deprived of these valuable contributions, and one is tempted to hold them in the hope that it might be possible to print them later. The possibility of such good fortune is so remote, however, that it is only fair to the authors,—especially of long articles,—to lay the situation frankly before them in order that they may recall their manuscripts for publication elsewhere.

SANITARY SERVICE IN THE WAR.

The Sanitary Reserve bill, regarding which we wrote in the June number of the JOURNAL, has passed the Senate and as we go to press is pending before the House.

"I understand," writes our correspondent in Washington, "that there are likely to be material changes in the form of the bill before it is enacted, and therefore anything I might write you now would be of little service."

Press announcements relating to sanitary service appear on pages 666 and 697 of this issue.

For the benefit of those who filed answers to the A. P. H. A. war service questionnaires, the Acting Secretary wishes to announce that these applications have been filed with the Medical Division, advisory Council of Defense, Washington, D. C.

AN IMPORTANT ALLY FOR THE PUBLIC HEALTH MOVEMENT.

Experts agree that there is a lamentable discrepancy between the state of our public health knowledge and the practical application of this knowledge in our cities and towns. Probably 400,000 persons die from avoidable causes in our country each year—there are 200,000 cases of typhoid fever alone—yet a comparatively small proportion of our cities have full-time health officers and the average health department appropriation is most inadequate. Even in the fundamental matter of death registration our records are reasonably complete for only two-thirds of the country.

Under these circumstances we should welcome the innovation represented by the Seventh Baby Campaign recently launched by the *Delineator* magazine. In brief, the magazine proposes to make its leading policy a carefully-planned and coherent series of articles and special stories which shall bring home, in attractive form, the facts regarding health work which people should know. At the same time, to render local service and concrete advice regarding particular problems, the magazine has gathered a working force of public health nurses, laboratory men, and sanitarians; and has selected infant mortality as the first rallying point of the campaign.

In interested cities and towns, between 10,000 and 40,000 population, the magazine is prepared to make, and is making, expert studies of infant mortality and the conditions affecting it, with corresponding programs to meet the local situations, not merely with regard to infant mortality, but with regard to public health work in general. In connection with these surveys active educational campaigns are carried on by means of newspaper stories, moving pictures, talks, and specially-prepared travelling exhibits. In addition, local committees are formed with reference to the different subjects of the investigation, so as to bring as many local persons as possible in touch with the work and to secure their permanent interest in their community health problems. Two travelling laboratories have been equipped and a sufficient field force has been gathered to make 50 surveys a year. The whole enterprise is in competent hands, being directed by Dr. C. E. Terry, formerly Health Officer of Jacksonville, Fla., as Health Editor, and Franz Schneider, Jr., formerly of the Russell Sage Foundation, as Associate Health Editor. The service is offered free, the only conditions being proper auspices and living expenses for a nurse.

That such a magazine has faith in its readers' interest in their community health and will commit itself to a definite health policy on such an extensive and expensive scale is an interesting and encouraging sign of the times. It reminds us that the prestige of our movement is gaining strength. From the situation of but a few years ago when a few sanitary prophets, despised as fanatics, were howling in the wilderness, we have arrived at a point where life insurance companies see a profit in expenditures for health education, where industrial concerns are beginning to understand that health work is good business, and where business interests will support museums of safety and sanitation.

If the fundamental assumption that readers can be interested in their community health is justified by the results of this campaign, it seems reasonable to believe that the scope of this kind of magazine work can be greatly broadened. Let us hope that this experiment is the beginning of a process by which the tremendous educational possibilities of our family magazines shall be developed and harnessed to constructive work for the common welfare.

SAVING SIGHT—SAVING CITIZENS.

EDWARD M. VAN CLEVE,

Managing Director, National Committee for the Prevention of Blindness.

Read before the General Sessions, American Public Health Association, Cincinnati, Ohio, October 27, 1916.

THE sibilant alliteration, "Saving Sight—Saving Citizens," indicated the purpose of an effort begun eight years ago by the Ohio Commission for the Blind, following the lead of the movement undertaken by the American Medical Association in 1906. It was my privilege to act as voice of the Commission for its first three years and I selected the words of my subject with the aim not only of attracting attention but of pointing out a serious condition and a proposed plan for meeting it. The fact is that few people knew that half of all blindness is preventable; it was our purpose first of all to advertise the condition and then provide means for avoiding needless loss of the most valuable of the senses. More and more effectively in these latter years, after the appointment of paid workers to carry on the movement, the Ohio public has been taught this truth of the preventableness of much blindness and today some millions of the state's inhabitants are not so ignorant as they were in 1908, though there are millions more still to be reached.

To save citizens—that is, effective, competent, unhandicapped citizens—is sufficient justification for making this effort a state function. And so the appeal has been made to spare the purse of the commonwealth by cutting off at its source the supply of children to be educated at large expense, and adults to be helped because blind, but needlessly so. For conservative estimates have been made by those best qualified by their special information to make them which show that for every child we allow to go blind the state is practically sure to spend from $4,000 to $8,000, the variation in amount depending upon the extent to which the education he received and his native ability render him self-supporting after reaching adult years. By actual count I found the state of Ohio was spending more than $25,000 a year in the education and maintenance at the state school of pupils blinded by one disease alone—and that the infection which doctors know can be prevented in almost 100 per cent. of the cases of its occurrence.

But the worker in the field of prevention of blindness, in common with other workers for the benefit of mankind, is not influenced so much by the obligation to save dollars to the state and to society as he is by the appeal of a misfortune to the individual that is in many cases to him and to his friends a calamity. No one can stand at the doors of our schools for the sightless and watch the steady procession of needlessly blind boys and

girls coming, coming, still coming, without a deep pity for these unfortunate victims of ignorance, carelessness, and indifference—a pity which soon becomes indignation and a burning desire to stop it; no one, I say, unless he, too, is ignorant, careless, indifferent. To interest the American Public Health Association in such a movement as the one for conservation of vision should not be difficult, for health officers, sanitarians, publicists, humanitarians are not careless, nor indifferent, and one would hardly dare ascribe ignorance to these chosen spirits.

How to go about the work of reducing blindness to its sad lowest terms is a practical problem for whose solution the National Committee for the Prevention of Blindness has been organized. Its purposes and aims are:

1. To endeavor to ascertain, through study and investigation, any causes, whether direct or indirect, which may result in blindness or impaired vision.

2. To advocate measures which shall lead to the elimination of such causes.

3. To disseminate knowledge concerning all matters pertaining to the care and use of the eyes.

The third object is the one which at the present stage of its life the Committee is endeavoring to reach, for by dissemination of knowledge alone can we hope to overcome the results of ignorance. To this end printed matter giving the most authoritative information on the subject is prepared, lectures and lantern slides for illustration are available, and both by personal service and by correspondence the Committee is helping the men and women who are solving the problem. Health officers and their staff of nurses, the visiting nurse associations, the superintendents of schools for the blind, women's clubs, individuals to whom has come the opportunity are bringing the facts to public attention and bringing the means of prevention to unfortunate victims. For these the Committee acts as a bureau of information and interchange of experience.

Naturally, the first object of attack is ophthalmia neonatorum, the disease which in 1915 sent more than two hundred children to enter for the first time the schools for the sightless in the United States. It is the cause for the presence of about one fourth of all the pupils in these schools. As long as an inflammation in the eyes of the newborn is considered a matter of no moment,—"Every baby has sore eyes," says the ignorant old-wife nurse too frequently responsible for the care of the new babies—as long as criminally ignorant professional midwives are permitted to practise, as long as criminally careless doctors have not the time or the inclination to take the needful precautions, as long as gonorrhea is looked on as a harmless infliction no worse than a cold, as long as physicians in families where the suspected presence of gonorrheal infection would be an affront are still unwilling to believe that ophthalmia is often caused by other germs and will not apply a prophylactic as a routine precautionary measure—so long will we have blind babies doomed to go through life with scarred or lost eyes

which might have been saved. Let the mothers of babies know that there may come to them such a calamity and let them know that prevention is possible and some reduction of the needlessly blind is bound to occur. Laws to bring about reporting and remedial measures in cases of ophthalmia neonatorum, some of them lame and ineffective and some unenforced, are on the statute books of 37 states; the enforcement and improvement of these laws and the agitation connected therewith are very helpful in this cause. In some localities effective coöperation between the the public health authorities and all private agencies leaves little to be desired in the carrying out of the best known means to prevent blindness from ophthalmia neonatorum. It can be prevented, the means are well-known. It should be as much a matter of pride for a city health department to announce that no blindness has occurred from neglect as to publish with self-gratulation that typhoid fever has claimed no victims in the district.

Trachoma is a menace not only in eastern Kentucky and its neighborhood and in the Indian reservations but it prevails in a much larger field than is generally known. The United States Public Health Service has done and is doing a great work in stamping out the disease where found in most alarming prevalence. We must secure much more general knowledge of the danger there is in impairment of vision from neglect in cases of trachoma, and coöperation of sanitarians and health officers to compel cleanliness where it is lacking in order to offer no field in which trachoma may flourish. Dr. J. A. Stucky's record as an unofficial investigator and a worker for the eradication of the disease of trachoma in Kentucky is known nationally and he has consented to come and give to this body some report of his experiences.

While ophthalmia neonatorum and trachoma are the two principal eye diseases with which the public officials of the Association have to deal, the education of the public to know that inherited syphilis is taking a toll of blindness in addition to the other calamities it brings, that some diseases of childhood bring loss of vision and that so-called "accidents" which cause children to be blinded are avoidable, together with other causes of impairment of vision in both children and adults, is the business of every health officer, sanitarian, humanitarian. One of the most encouraging movements of recent years is the establishment of social service departments in our great hospitals. It is only a new venture but the results in the special department of conservation of vision are most encouraging and point the way to the need of extension of such service.

In one other field of activity of the National Committee for the Prevention of Blindness this Association will doubtless take deep interest. Another interesting and hopeful movement is that for general, frequent, careful examination of the eyes of the young in public and private schools for the discovery and correction of ocular defects. Among the results of this inspection one of the most valuable is the establishment of classes for children of par-

tial sight, with special appliances and methods particularly adapted to the instruction of these young people. They are not blind, in the true sense of the word, yet they are not capable of doing in the regular way the work done in classes of unhandicapped children. Massachusetts has made a most careful study of the situation and classes for such children have been or are about to be established in five cities of that state. New York City has several centers for sight-saving classes. Here in Ohio, in Cleveland, Toledo, and especially here in Cincinnati, conservation of vision classes are in operation. Dr. Wm. H. Peters has had a good deal to do with the inspection of the children in the public schools and the formation of these classes in Cincinnati and will give an account of his efforts in these matters.

Because people with the hurt of pity in their hearts, pity that innocent children were being given a heritage, thru neglect and careless indifference, of a life-long handicap, were stirred to seek a means of preventing such loss, stirred to some action that would save our people from the results of ignorance, this National Committee for the Prevention of Blindness was formed. The deep sentiment of human helpfulness—it stirred Dr. Lucien Howe of Buffalo to secure the legislative acts of 25 years ago and call public attention to facts that were unknown, and after him that other Buffalonian, physician and publicist, Dr. F. Park Lewis, to arouse his profession to be a force for popular education, head of the Committee on Conservation of Vision of the Amerian Medical Association, and to him succeeded as chairman of this section of the Council on Health and Public Instruction the vigorous and earnest Dr. Frank Allport of Chicago; it was a sense of the privilege of helping a singularly helpless people that induced that friend of the Kentucky mountaineers, Miss Linda Neville, to spend her days and nights in a noble service; it was this deep sense of pitiful indignation that children who need not have gone blind were being permitted thru ignorance to lose their vision and of determination that it must not be, which stirred to action that modest, noble woman, Miss Louisa Lee Schuyler, Doctor of Laws (the only woman to receive such degree from Columbia University), philanthropist, to inaugurate with the help of physicians this lay movement for the education of the public to prevent needless blindness.

It will not answer to keep all knowledge of how to help human ills or to avoid them as the occult secrets of a profession. Nor is it all sufficient that these be decorously proclaimed in assemblies of the educated and the elect. Press and public speaker, officer of the public health and nurse of the settlement, and every friend of the cause must become teachers of the facts. And some must shout the truth if ever it will be heard. In that terrible arraignment of modern society, Brieux's "Damaged Goods," a society which excuses its "conspiracy of silence" about the dread disease of syphilis with a futile "I did not know," the leading character is made to say, "If I could, I would cry it aloud from the housetops." And so it is the duty

and the privilege of all of us who are engaged in this important educational movement to obey in our day the command which came in his day to the prophet Isaiah, to "cry aloud, spare not, lift up the voice like a trumpet."

I invite the members of this great American Public Health Association to coöperate with the National Committee for the Prevention of Blindness in the earnest effort now being made to spread the gospel of saving sight.

◈

ACTIVATED SLUDGE EXPERIMENTS AT THE UNIVERSITY OF ILLINOIS.

EDWARD BARTOW, F. W. MOHLMAN and J. F. SCHNELLBACH.

(Abstract, see Eng. News 76, 972-3, 1916.)

THE first series of experiments at the University of Illinois, begun November 1, 1914, was conducted in three-gallon bottles. The second series was conducted in a tank 9 inches square and 4½ feet deep. The third series was conducted in four tanks each having an area of 10 square feet and a depth of 9 feet. Experiments in the first three series were carried on by the fill and draw plan. The fourth series is being conducted with a continuous flow.* The sewage is pumped from the main outlet sewer of the city of Champaign to a grit chamber, from which it flows into an aeration chamber, divided longitudinally by 3 baffles into 4 compartments.

The lower part of each compartment has sides sloping towards the center, to a channel 10½ inches wide and 4 inches deep extending lengthwise through the tank. Above this channel Filtros plates are supported on T-bars that have been imbedded in the concrete.

The aerated sewage and sludge flows from the aeration chamber to the settling chamber. In order to assist the settling of the sludge, the liquid is passed down through the center and up around the edges of a hollow wooden frustum of a pyramid placed in the center of the settling tank. From the settling tank the effluent flows over a weir to the creek or into a pond, formed by two dams placed across the abandoned bed of a small stream.

The sludge is withdrawn from the settling chamber by an air lift and can be discharged into the raw sewage where it enters the aeration chamber, or can be diverted for experimental purposes, or to the sewer.

No special effort was necessary to build up activated sludge. The plant has simply been put into operation, allowing the effluent from the settling chamber to escape while pumping back the sediment. From the start 90 per cent. of the suspended matter was removed and after 13 days of operation stable effluents were obtained.

The results obtained have been very gratifying. Purification is indicated by the presence of from 5 to 8 parts per million of dissolved oxygen and the stability to methylene blue of from 5 to 15 days. The effluent is odorless, and generally clear, though at times, because of the insufficient capacity of the settling chamber, it contains small particles of sludge.

*Eng. News, 42, 111, 1899.

REPORT OF COMMITTEE ON SEWAGE WORKS OPERATION AND ANALYTICAL METHODS TO THE SANITARY ENGINEERING SECTION OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.*

YOUR committee has made two reports relative to the principles of operation and recommending analytical tests for use in connection with sewage treatment works. It appears advisable to review certain features of these prior reports before proceeding with the matter of state supervision over sewage works operation which is the subject of this report.

The purposes of sewage treatment are:

(a) "To promote the comfort and convenience of the people by maintaining water courses in a decently clean condition, *i. e.*, free from nuisance to sight or smell so as to be fit for civic development, industry and recreation.

(b) "To aid in protecting the public health, when necessary, by maintaining water courses as fit sources of water supply after adequate purification or for the cultivation of shell fish."

The operation of sewage treatment works may be judged by the following standards:

(a) "Prevention of nuisance either at the works or in the body of water receiving the effluent.

(b) "Protection to the public health, *e. g.*, in reducing the pollution in a water course to relieve the load on a water purification plant."

Due to the many forces of nature utilized in sewage treatment and the heterogeneous composition of sewage, it is self-evident that the operation of sewage treatment works cannot be made automatic but requires observation and supervision by trained, skilled operators at more or less frequent intervals, in order to accomplish the purpose for which the plant was installed and the funds invested.

Table No. 1 of analytical tests was submitted by the committee in 1914* and their use, when possible, is again urgently recommended.

It is recognized that in a great number of small works, the purpose of which is primarily to prevent the creation of nuisance, only the simplest tests are practical under present conditions and it is recommended that in such cases samples of the final effluent be incubated at room temperature with methylene blue and record kept of the number of days the samples retain their blue color. The required degree of stability depends largely upon the conditions in the receiving body of water. Where stability is demanded, on account of the dilution afforded being small, the samples of the effluent should retain their blue color at least ten or twelve days at room temperature or five or six days if incubated at 37° C.

Attention is again called to the importance in selecting analytical tests for sewage works, to the fact that changes in methods of operation and

* Presented at the Cincinnati Meeting, October, 1916.

* See this Journal, Vol. V, No. 9, Sept. 1915, p. 936.

records for comparison are the primary purposes of this work and the acquirement of mere academic information, while interesting, is energy wasted which could better be expended in other directions.

Considering the number of municipal sewage treatment works in America, it is surprising to learn how few are subject to laboratory control; but the newer plants are being so equipped and show the growing appreciation of the economy of proper operation.

Another very noticeable defect in the design of a large percentage of works is the complete absence of any method of determining the amount of sewage treated. This is of prime importance to successful operation, for otherwise retention in tanks and rates on filters are indeterminate and it is difficult, if not impossible, to know whether unsatisfactory results are due to overloading of the parts of the works or to improper methods of operation.

Where a fall is available a weir, preferably with an automatic recording device, is a simple and inexpensive method to use. Where the sewage has to be pumped, the venturi meter has proven successful. In works having a dosing tank, an approximation of the rate of flow may be obtained by the use of a float actuated counter, which indicates the number of discharges of the dosing tank. In the case of heavy flow, when a considerable amount of sewage runs in while the tank is discharging, the total discharge may be obtained by the following formula:

$$D = (n + \frac{ne}{f})v$$

in which D = total discharge in unit of time; n = number of discharges in the same unit of time; e = time of emptying; f = time of filling; v = volume of dosing tank.

When e is very small as compared with f, then $\frac{ne}{f}$ may be omitted and $D = nv$.

Your committee in its report last year called attention to the fact that "as the great majority of sewage treatment plants in America are small and frequently widely separated, it is apparent that the needed expert supervision cannot be obtained locally and that efficiency of operation can only be obtained through some central authority."

In some states, associations of those interested consisting of sewage works superintendents, state engineers and others are now being formed to hold meetings periodically to discuss practical questions on operation. The formation of such bodies and their frequent gatherings are highly recommended by your committee. Such meetings stimulate interest and are sources of information to many.

One of our correspondents stated:

"We suffer greatly in this state because of unskillful operation of sewage treatment plants. Some of our plants receive almost no attention. In other cases, services are employed, but they are either inadequate or inefficient."

The State Boards of Health are the logical bodies to provide this supervision, due to their uniform relation to all the municipalities in each state and with similar boards in adjacent states.

Furthermore, the sanitary disposal

STATE	OFFICER FURNISHING DATA		POPULATION OF STATE IN 1910	NUMBER OF WORKS IN STATE				NUMBER OF WORKS WITH LABORATORY	STATE BOARD OR DEPARTMENT OF HEALTH				
	NAME	TITLE		TOTAL NUMBER	FOR POPULATION OF 25 TO 500	FOR POPULATION OF 500 TO 10,000	FOR POPULATION OF OVER 10,000		REQUIRES APPROVAL OF PLANS FOR SEWAGE PRIOR TO CONSTRUCTION.	EXERCISES SUPERVISION OVER OPERATION.	MAKES INSPECTION.	MAKES ANALYSES OF SEWAGE AND EFFLUENT.	RECEIVES REPORTS OF OPERATION.
CALIFORNIA	C.G.GILLESPIE	CHF. ENGR.	2,377,300	100±	NUMEROUS	90	3	0	YES	YES	OCCASIONALLY	YES	HAVE POWER NOT YET
ILLINOIS	R.HANSEN	CHF. ENGR.	3,638,600	75	4	61	10	0	YES	NOT YET	NOT YET	BY STATE WATER SURVEY	RULE PASSED NOT YET
IOWA	L.HIGGINS	SAN. ENGR.	2,224,800	85	1	82	2	2	YES	TO SOME EXTENT	YES	YES	YES AFTER JAN. 1. 1917
KANSAS	G.A.HASKINS	CHF. ENGR.	1,690,900	67	9	53	5	0	YES	YES	YES	YES	JUST INSTALLED
MARYLAND	R.B.MORSE	CHF. ENGR.	1,295,300	13	0[c]	12	1	1	YES	YES	YES	YES	NOT YET
MASS.	J.H.GOODNOUGH	CHF. ENGR.	3,366,400	58+	34+	11	13	3	YES	YES	YES	YES	YES
MICHIGAN	E.D.RICH	STATE SAN. ENGR.	2,810,200	38	22	14	2	0	NO	YES	YES	SOMETIMES	SOON
MINNESOTA	H.A.WITTAKER	DIRECTOR	2,075,700	79	44	32	3	0	NO LAW BUT NEARLY ALL SUBMIT PLANS	TO SOME EXTENT	YES	YES	NO
NEW JERSEY	C.G.WIGLEY	CHIEF BUR. OF ENGR.	2,537,200	168[a]	66	89	13	2	YES	YES	YES	YES	SOON
NEW YORK	T.HORTON	CHF. ENGR.	9,113,600	178	73	90	15		YES	PARTIAL	YES	YES	IN SOME INSTANCES
OHIO	W.H.DITTOE	CHF. ENGR.	4,767,100	162	92	64	6	1[d]	YES	YES	YES	YES	NO
PENN.	C.E.EMERSON JR	CHF. ENGR.	7,665,100	117	61	47	9	17 32 PARTIAL	YES	YES	YES	YES	YES
TEXAS	V.M.EHLERS	SAN. ENGR.	3,896,500	40	2	37	1	2	NO LAW-MAJORITY SUBMIT PLANS	STANDARDS REQUIRED	YES	YES	YES
VIRGINIA	R.MESSER	SAN. ENGR.	2,061,600	44	22	22	0	1	NO LAW BUT PLANS PASSED ON	NO LAW BUT SUPERVISED	YES	NO	NO
WISCONSIN	W.G.KIRCHOFFER	SAN. ENGR.	2,333,800	70±	0	60±	10±	0	YES	YES	YES	YES	NO
			TOTALS	1294	437	764	93						
			PERCENT	100	34	59	7						

(a) 15 Trade wastes plants, etc., not included.
(b) Some cities have more than one plant, hence total number is 81.
(c) Many small institutional plants not included.
(d) 4 Additional laboratories planned for.

TABLE NO. 2 ACCOMPANYING 1916 REPORT OF COMMITTEE ON SEWAGE WORKS OPERATION AND ANALYTICAL METHODS, AMERICAN PUBLIC HEALTH ASSOCIATION.

of sewage is a matter generally affecting the commonwealth more than the individual community. The state is interested in requiring that sewage treatment works accomplish the best results possible, while the separate communities are naturally anxious that the works shall meet the requirements at the minimum expense for operation, additions and renewals.

It may be assumed, therefore, as an axiomatic statement, that for the good of the commonwealth, the municipalities and private owners, any procedure which will accomplish the above conditions is worthy of careful study and adoption.

During the past year, your committee has been corresponding with the sanitary engineers of the various State Boards and Departments of Health to obtain their views on our last year's report and their present and proposed procedure relative to control over the installation and operation of sewage treatment works.

For the purpose of this report, we have divided the forty-eight State Boards of Health in the United States into three groups as follows:

(a) Those states whose Boards of Health either have no engineer upon their staff, or have no specific legislation giving them control over the disposal of sewage, or have so few sewage treatment works under their jurisdiction that the subject is negligible. These twenty-four states in 1910 had a population of over 24,250,000, or 26 per cent. of the total population of the United States, and are:

Alabama, Arizona, Arkansas, Colorado, Delaware, Georgia, Idaho, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, South Carolina, Tennessee, Utah, Washington, West Virginia, Wyoming.

(b) Those states whose Boards of Health have an engineer or other officer charged with supervision over disposal of sewage, but whose legal powers are limited and the number of sewage treatment works are small. The officers of this group of states have all signified their willingness to coöperate with your committee and have furnished valuable data.

These nine states in 1910 had a population of 12,753,000, or 14 per cent. of the total population of the United States, and are:

Connecticut, Florida, Indiana, Kentucky, Louisiana, Maine, New Hampshire, North Carolina, Rhode Island, Vermont.

(c) The remaining fifteen states have Boards of Health with engineering divisions and either have legal authority or otherwise exercise control over the disposal of sewage and operation of sewage treatment works. The 1910 population in these states was about 54,000,000, or 60 per cent. of the total population of the United States.

The conditions in these states are given in Table No. 2, from which it will be seen that, generally, sewerage plans must be approved before construction and supervision, inspection and analyses are made and in some reports of operation are made to the State Board of Health.

The approval of plans for sewerage projects by the commonwealth is of

great advantage to the community, institution or individual about to expend funds for the construction of sewers or sewage treatment works; for it assures the carrying out of the work along comprehensive lines, which ultimately is economy, prevents the construction of illy or improperly designed works, and tends to uniformity of practice throughout the state.

The supervision over operation and inspection of sewage treatment works by the state in cases where works are efficiently operated becomes an endorsement more than anything else. In the case of the smaller works, which are frequently placed in charge of untrained and technically deficient operators, state supervision not only protects the commonwealth but makes possible the performance of the functions of the works for which they were designed and the funds invested.

To give concrete example, one of our correspondents wrote:

"The greatest difficulty is in the small city where the city surveyor is responsible for the operation and whose term of office is short and uncertain. There necessity for close observation by the State Board of Health is urgent."

And another stated:

"Our municipal sewage plants . . . have had practically no supervision either by the State Board of Health or by local authorities. Many of our municipalities seem to think that after a sewage disposal plant has been installed they have finished their obligations. We have even found cases where the local authorities were doubtful as to the location of the plant."

It will be noted in Table No. 2 that commonwealths representing more than half the population of the United States have given their State Boards of Health these powers, but it will be further noted that at the present time only in Massachusetts, Pennsylvania and Texas is the operation of the sewage treatment works regularly reported to the state officials. Several other states are preparing to inaugurate this means of exercising supervision, and your committee therefore deems the time ripe for a thorough discussion of these matters in the hope that from it those state engineers who are planning to put such a system into practice may obtain helpful suggestions from the experience of others and that State Boards of Health not now clothed with sufficient powers to protect and aid their citizens properly may succeed in obtaining legislation to that end.

Submission of Sewerage Plans for State Approval.

Prior to contracts being made for the construction of sewerage works (sewers, pumping stations, or treatment works), plans of the same should be submitted to the State Board or Department of Health for examination, and, if satisfactory, approved.

The examination should include a determination of comformity to a comprehensive plan proper for future conditions even though in many cases it may not be necessary to construct, at first, any more than part of the sewer system and only provide for preliminary treatment of sewage.

The adoption of a comprehensive plan, if only in outline, assures the

future utilization of each part of the entire project as built.

The examination of the plans submitted should also include the fitness of the design and types of treatment to produce the quality of effluent demanded by the conditions of the receiving body of water. For example, it is unjust and a waste of public funds to approve, without comment, a complete treatment works for sewage to be discharged into a receiving body of water where neither the public health nor aesthetic conditions require at the present time more than preliminary treatment.

In the interest of economy of both public and private funds, it is most desirable to obtain coöperation between designing engineers and the state officials especially during the preparation of the preliminary plans. For example, take the case where, in accordance with an order of the state officers, the engineers of a town are beginning the studies needed to prepare the preliminary plans; if, by conference between the officers of the state and of the town, a decision could be reached that in order to protect shell fish beds clarification and disinfection only would be required, the designing engineers at the minimum expense could select types of processes to meet only these requirements, rather than make studies for submission to the state in ignorance of the policy adopted by the commonwealth for that stream or part of the stream.

This coöperation between the separate communities and the commonwealth also avoids delays in final approval and there would be greater assurance of approval without requirement of changes in the final plans which cause delay in construction and needless expense to the applicants.

The plans as approved should be filed with the state and no material deviation in design permitted without state approval.

Subsequent additions or changes in construction should likewise be approved and filed.

In addition to the obvious advantages to all concerned, this procedure provides the state with correct plans of all the sewerage works within its jurisdiction which are needed for proper supervision of operation.

Supervision of Operation.

Upon completion of the construction of sewage treatment works it very frequently happens that the operation is intrusted to persons entirely unfamiliar with the intent and purpose of the designer. It is particularly important that early operation, where adjustment of parts must be made to meet unanticipated conditions, should be intrusted to either the designer or some engineer familiar with all the intricacies of operation. This provision can be met by a requirement in the permit of approval issued by the state for the construction of the works.

An examination of Table No. 2 shows that over one-third of the plants given therein are designed for populations of less than 500, over one-half for populations between 500 and 10,000, and only 7 per cent. for populations over 10,000.

Generally, only cities at the present time can afford to provide expert

operators for sewage works and the percentages given strongly confirm the statements in last year's report relative to the need for state supervision over operation.

In justice to the larger cities, it should be borne in mind, however, that most of the large cities of this country are situated upon large rivers or great bodies of quiescent water, so that up to a short time ago the necessity for sewage treatment was not fully realized. Many of these municipalities have spent great sums for sewer systems with but little thought of the question of sewage treatment, so that the interception of the sewage and its transportation to treatment works, together with changes necessary in the existing system, requires detailed studies and large expenditures for preliminary work in most cases before the construction of the treatment works can be undertaken. Many of these cities are now engaged in this preliminary work.

This supervision should include inspection of the works, analyses of sewage and effluents, and examination of records of operation. With these data the state officials can advise those in charge of the works how to operate them to obtain the optimum results.

Inspections and sampling by the state should be done not at regular intervals but at such times when critical conditions exist in order to be familiar with the results obtained at times of maximum load when defects are most noticeable. This is not meant to base judgment of regular operation by observations under worst conditions but to obtain data for helpful suggestions to those in charge. Regular conditions are obtained from the reports of operation to be discussed later.

As illustrating the importance of laboratory analysis of samples, an official of one of the most experienced State Boards of Health in this matter wrote:

". . . it is impossible to determine the character of sewage through visits and without analysis of samples. A case occurred in this state where an engineer of large experience examined an open sewer in that way and reported that it was sewage. As a matter of fact, analyses of numerous samples disclosed that it averaged only about 10 per cent. of the strength of ordinary sewage and rarely exceeded 15 per cent. of that strength. On the other hand, I have seen sewages four or five times as strong as the average on account of manufacturing wastes, the condition of which was not disclosed by the appearance of the liquid."

For the purpose of recording results of inspections, regular forms should be provided to minimize the clerical work of the inspector and systematize the data as filed.

Reports of Operation.

Your committee has carefully considered the preparation of a standard form of report and has come to the conclusion that it is impracticable to do so.

Conditions in the various states and even in different parts of the same state differ between such wide limits that data absolutely essential in some places are useless in others. However, some basic principles may be given.

The data furnished should only in-

clude essential matters to a proper understanding of conditions and results accomplished.

The engineer of one of the State Boards of Health wrote us:

"The kind of information collected . . . is that which is most important for us to know about that particular (plant). In many cases there is additional information, sometimes a large amount of it, that we would like to obtain, but if we attempt to obtain it we overburden the operator and are apt to get nothing at all. . . . We confine ourselves to the essential facts and collect these facts ourselves if we cannot get them from the attendant in charge."

Oftentimes matters of considerable moment to the operator for purposes of official record are unessential to the state and hence should be eliminated. The data to be recorded should be determined jointly by the official of the state and the operator. In this way the state will obtain uniformity of records by obtaining the same essentials for each process used.

For example, it may not be essential for the operator to know the time of retention of sewage in a tank. But if the record contains a statement of the rate of flow, the state officials from the plans filed may obtain the information when needed.

It is essential, if comparison is to be made between results obtained from different laboratories where samples are plated, that the report of number of bacteria should be accompanied by a statement of the kind of media, temperature and time of incubation that was used.

The records should be made on sheets either 8½″ x 11″ or of such dimensions as to fold to that size to facilitate filing in standard letter files. They should preferably be made in pads so that the operator by placing carbon paper beneath the upper sheet can obtain a copy for himself.

Under present conditions it is advisable that generally these records should be sent to the State Board or Department of Health at monthly intervals, although it is recognized that in some cases reports at weekly intervals should be required, and in special cases records may be required at irregular times to indicate certain conditions essential to proper protection to the public.

Generally, reports should be submitted by all sewage treatment works. In cases of small domestic or institutional plants it may be felt that there is practically nothing to report. But in such cases if the owner is required to send a report to the state setting forth the condition of the plant it is an incentive to at least examine its operation occasionally, which otherwise would be overlooked.

It is important, if reports are to be of any value save as records, that they should be sent to the state officers as soon as practical after the close of the period covered by the report.

Responsibility of State Boards.

In making the above recommendations, your committee recognizes that it places added work upon engineering staffs which at present, in most cases, are already overburdened and insufficiently provided with funds.

To carry out the recommended

procedure also places responsibility upon the state officials and calls for expert knowledge concerning all the details of sewage works operation.

It is therefore necessary that the funds be provided by the various legislatures and that trained men be placed in charge if the procedure recommended is to be successfully carried out.

Respectfully submitted,

F. E. Daniels,
C. A. Emerson, Jr.,
C. B. Hoover,
Richard Messer,
W. L. Stevenson, *Chairman.*

APPENDIX.

The sewage treatment plants in Ohio have been classified and subdivided by Mr. W. H. Dittoe, Chief Engineer of the Ohio State Board of Health as follows:

"Class 1. Municipal sewage treatment plants. These include plants of various types installed to serve the entire area of a municipality or the major portion thereof;

"Class 2. Sewage treatment plants for realty allotments and districts of a municipality. These include plants principally installed as private enterprises in connection with the development of real estate either within or without an incorporated municipality. They also include plants which serve small sections of a municipality;

"Class 3. Sewage treatment plants for industrial establishments. These include plants installed for the treatment of sewage from industrial plants and are not to be confused with plants installed for the treatment of industrial wastes;

"Class 4. Sewage treatment plants for public institutions. Public institutions cover state, municipal and county institutions;

"Class 5. Sewage treatment plants for private institutions, country clubs, etc.;

"Class 6. Sewage treatment plants for summer resorts, chautauqua grounds and summer camps;

"Class 7. Sewage treatment plants for school buildings.

"The following table gives the number of plants in each class at present existing and under construction.

EXISTING SEWAGE TREATMENT PLANTS IN OHIO, AUGUST, 1916.

Population designed for.	Less than 500.	500 to 10,000.	Over 10,000.	Total.
Class				
1.....	1	49	6	56
2.....	10	1	–	11
3.....	6	1	–	7
4.....	31	9	–	40
5.....	13	1	–	14
6.....	1	3	–	4
7.....	30*	–	–	30
Totals.....	92	64	6	162

*Approximate.

"The data regarding the first 6 classes are as accurate as it is possible to obtain them. The approximate number of installations for treatment of sewage from school buildings is given. During the years 1912 to 1916 (August 1) we have approved plans for sewage treatment devices for 60 school buildings and we estimate that about 30 of the installations have been made. They include treatment devices rang-

ing from tanks to complete plants involving intermittent sand filters.

"In addition to the existing plants given in the table, 6 plants under Class 1 are being constructed. Three of these are designed for populations between 500 and 10,000 and 3 for populations over 10,000. The Columbus plant is the only one at present having laboratory control. However, provision for laboratory control has been made for the new plants at Akron, Canton, Alliance and Sandusky."

AMMONIA FROM THE ACTION OF CAUSTIC SODA ON ORGANIC MATTER A SOURCE OF ERROR IN THE DETERMINATION OF NITRATES IN SEWAGE AND SEWAGE EFFLUENTS BY THE REDUCTION METHOD.

STEPHEN DEM. GAGE and HENRY H. ANDERSON,
Laboratories of the Rhode Island State Board of Health.

(Abstract.)

IN the determination of nitrates in sewage etc., by reduction to ammonia with caustic and aluminum foil, ammonia is formed by reacton of the caustic on the more easily decomposed organic matter which is read with that derived from the reduction of the nitrates and nitrites.

When the caustic is added before boiling off the free ammonia, as recommended in the Standard (A. P. H. A.) methods, the ammonia formed during the boiling process is driven off, but as the reaction continues during the reduction period, the results will be in error unless a correction is made for this organic ammonia.

With the standard procedure the errors from this organic ammonia are seldom less than 0.1 part nitrogen per million even when the organic matters are low and well oxidized as in effluents from well operated sand and sprinkling filters, while with raw sewages this error may amount to 1.0 part or more.

In many laboratories the caustic is not added until after boiling of the free ammonia. With this procedure the organic ammonia from the action of the caustic is seldom less than 0.5 part N. per million and with some sewages may average 3.0 to 5.0 parts per million.

For accurate work the ammonia derived from the action of the caustic on the organic matter should be determined for each sample and deducted from the total ammonia obtained from the reduction process.

When both sets of results have been corrected for organic ammonia from the caustic treatment there is a very close agreement between the results obtained by the standard procedure and those obtained by adding caustic after boiling off the free ammonia.

SOME OBSERVATIONS ON THE BACTERIAL EXAMINATION OF MILK.*

DR. FRANCIS H. SLACK,
Director, Sias Laboratories, 227 Summit Avenue, Brookline, Mass.

THE milk industry has been revolutionized during the past ten years largely on account of the introduction of bacterial examinations and the consequent emphasis placed upon cleanliness and care during the production and transporation of this important food.

The value of uniform methods of procedure in making these tests was early recognized by the Laboratory Section of the American Public Health Association and the standards adopted by the section have been widely accepted and followed.

It has been the effort of the Committee on Standard Methods of Bacterial Milk Analysis to recommend, as far as possible, those standards which approximated in their results, the actual number of bacteria present in the sample, and indeed this is the only attitude to take, since methods which result in reports of excess or greatly diminished numbers of bacteria compared with those actually present are open to criticism either of favoring or discriminating against the producer.

It is of the utmost importance then that the methods by which the bacterial count are made should be beyond question or suspicion. It has been truly observed of most of the manipulations employed that any error present favors the producer and that on account of various difficulties in obtaining growth or visible colonies of all the bacteria present the reported count is always lower than the actual number of bacteria present.

It should be our effort in further development of the standards to reduce this discrepancy and no standard commonly accepted and used should be replaced by a new one until repeated careful tests by competent workers have proved the superiority of the new method to the one discarded.

The adoption, for instance, of media made with meat extract instead of with fresh beef juice is, in the writer's opinion, a retrogressive step, and one that unnecessarily favors the producer by allowing him to exercise less care and by permitting much milk upon the markets which would be held up on account of high bacterial content if a medium were used more favorable to the growth of milk bacteria.

The same is true of the present standard meat extract agar with 1½ per cent. agar and plus 1 reaction, Fuller's scale, as compared with the former standard beef juice agar with 1 per cent. agar and plus 1.5 Fuller's scale. The original medium was adopted only after the most careful research by Prof. C. E. Marshall and his assistants who made thousands of tests comparing various strengths of agar and different degrees of acidity of the media.

Partly with these thoughts in mind

*In order to avoid excessive cost of publication, numerous ta les accompanying this paper have been omitted. Any person interested in special details can obtain further information from the author.—EDITOR.

and also to gather data on other aspects of milk examinations yet in the debatable stage, the following tests were undertaken. The writer regrets that the call of two members of his small staff to the Mexican border coming at the regular vacation time when others had to be released cut this work short before it had attained that degree of completion he had planned, and only offers it in its present state as an evidence of his sincere interest and with the hope of pursuing the investigations outlined more fully in the future.

The first tests were begun by four members of the Boston Health Department laboratory staff with the following objects:

1. To compare counts on plates grown for twenty-four hours and forty-eight hours at 37 degrees C.

2. To compare counts obtained from the beef juice medium 1 per cent. agar reaction plus 1.5 as recommended originally by the Milk Committee with counts from the meat extract media 1.5 per cent. reaction plus 1 since recommended.

3. To compare microscopic estimates made by the smeared sediment method with the plate counts.

4. To compare the reports of several independent workers upon the same samples of milk.

Professor James O. Jordan kindly consented to arrange for the collection of samples and the division of each into four parts identified by marks known only to him. The divided samples, in groups of five, were then given to four of the laboratory bacteriologists for the work outlined. The tests were made and the returns handed to Professor Jordan who collated them as they appear in the tables. Each worker performed his tests independently and plated from such dilutions as seemed best to him judged by his microscopic estimate, it being understood that each sample was to be plated with both the old and the new agar, two dilutions to be plated out for each sample with each of the media and all plates to be made in duplicate. With four workers this called for thirty-two plates to each sample, or a total of 640 plates for the series.

A careful comparison of the results obtained showed that the 48 hour count was 2.59 times the 24 hour count with the beef juice media and 3.27 times the 24 hour count with the extract media.

The beef juice media averaged 1.80 more colonies with the 24 hour count and 1.62 more with the 48 hour count than the extract media.

A marked feature in comparison of the two media is the minute size of the colonies on the new or extract media as compared with the old media it replaced. Even with the 48 hour count many of these colonies are barely within the range of visibility while on the old media the colonies as a general thing show very plainly.

In comparing the microscopic estimate with reported counts it must be remembered that this is but an estimate and claims are not made for great accuracy. No attempt is made to actually count the organisms under the microscope but the specimen is quickly "sized up." In routine work in the Boston laboratory the estima-

tion is made only to judge the bacterial content with relation to our standard of 500,000 to the cubic centimeter. When the estimate is below 500,000 the sample is passed without further work and as a large percentage of the samples are well within this limit the use of this preliminary examination saves much labor and material. If the estimate is around or above 500,000, plates are made to find, as nearly as possible, the actual count.

COMPARISON OF REPORTS OF FOUR WORKERS ON TWENTY MILK SAMPLES.

48 hour count, old standard media.

No.			
1.	All agree on counts below 500,000.	Reports vary from	88,000 to 310,000
2.*	Three " " " " "	" " "	120,000 " 240,000
3.	All " " " " "	" " "	196,000 " 284,000
4.	All " " " above "	" " "	32,000,000 " 62,700,000
5.	" " " " below "	" " "	8,000 " 16,000
6.	" " " " " "	" " "	20,600 " 80,500
7.	" " " " " "	" " "	101,000 " 117,500
8.	Three below and one above 500,000	" " "	171,800 " 530,000
9.	All agree on counts below 500,000	" " "	140,000 " 245,000
10.	" " " " " "	" " "	32,500 " 60,000
11.	" " " " " "	" " "	250,000 " 450,000
12.	" " " " above "	" " "	3,640,000 " 6,900,000
13.	" " " " " "	" " "	3,750,000 " 54,000,000
14.	Two below one above 500,000 one spreader	" " "	303,000 " 797,500
15.	Three above one below 500,000	" " "	225,000 " 1,460,000
16.	All agree on counts below 500,000	" " "	80,000 " 230,000
17.	Three below, one above 500,000	" " "	315,000 " 580,000
18.	" above, " below "	" " "	185,000 " 1,280,000
19.	All agree on counts below 500,000	" " "	1,000 " 3,400
20.	" " " " above "	" " "	6,500,000 " 69,500,000

* The report of the fourth worker on this sample 48,500,000 was evidently due to contamination of sample.

When the estimate is above 1,000,000 accuracy as to the exact number of millions present is not attempted unless the worker so desires.

In these particular tests, 73 microscopic estimates were made where a count was reported after 48 hours' growth on the best media, of which 65 agree with the report of the worker in relation to the 500,000 standard. Of the remaining eight, four were given an estimate above the count and would have been plated in routine work, the other four, or a little over 5 per cent. received too low an estimate and would have been passed.

There were fourteen microscopic estimates of 500,000. (In routine work these of course would be plated.) The reported counts on these fourteen samples showed eight with a count below that limit ranging from 114,500 to 380,000 and six above it varying from 530,000 to 4,200,000.

Reporting on twenty samples the four workers agree on fourteen with relation to the standard of 500,000. Of the remainder, three agree on five and the sixth is two to one and one spreader.

Assuming that count to be correct on which a majority of the workers agree it is shown that fourteen of these twenty samples had counts below 500,000 and six had counts above that figure.

Of the fourteen samples, each plated by four workers, we have fifty-six reports, fifty-one of which are agreed on counts below 500,000. Of the remaining five, one count, on sample two, is so far different from the others on the same specimen that it is evidently the result of an error. Three were near the 500,000 line being 530,000, 580,000 and 797,500 respectively, and one was a spreader.

On the six samples with more than 500,000 there are 24 reports 22 of which are agreed, the other two being 185,000 and 225,000 respectively.

These tests in the opinion of the writer demonstrated undoubted superiority of the 48 hour count over the 24 hour count and of the meat juice medium over the extract medium.

It was decided to run another series of tests for further comparison of results of different workers using the meat juice media alone with the understanding that an attempt would be made in each instance to secure plates with counts between 20 and 200 colonies and that wherever possible counts should be reckoned from these plates only.

COMPARISON OF REPORTS OF DIFFERENT WORKERS ON THIRTY SAMPLES OF SECOND SERIES.

Sample.	Workers.	Agree on counts below 500,000.	Agree on counts above 500,000.	Disagree on count.	Remarks.
1.	5	..	5	..	....
2.	5	..	5	..	....
3.	5	..	5	..	....
4.	5	..	5	..	....
5.	5	..	5	..	....
6.	5	..	5	..	....
7.	5	5	..	..	....
8.	5	5	..	..	....
9.	5	2	3	..	....
10.	5	5	..	..	....
11.	4	4	..	..	....
12.	4	..	4	..	....
13.	4	..	4	..	....
14.	4	..	3	1	....
15.	4	4	..	..	....
16.	3	3	..	..	....
17.	3	..	2	1	....
18.	3	3	..	..	....
19.	3	..	2	1	....
20.	3	2	..	..	1 spreader
21.	3	..	2	1	....
22.	3	..	3	..	....
23.	3	..	2	..	1 spreader
24.	3	2	..	1	....
25.	3	..	3	..	....
26.	3	..	3	..	....
27.	3	..	..	..	....
28.	3	3	3	..	....
29.	3	..	3	..	....
30.	3	..	3	..	....

Second Series of Tests.

This series consisted of thirty samples collected and divided as before. Five samples were tested each week by as many men, varying from three to

five, as could be spared for the work. Checks were also made on the counts and, after the first five samples, on the microscopic estimates by having each worker's plates counted again by another and by having each worker's sediment smears examined again by another worker for comparison on the microscopic estimate. All tests were made with the old standard media and reported on 48 hour counts.

In this series of tests there were 115 microscopic estimates made by the smeared sediment method, of which 103 agree with the reported count as being above or below the 500,000 standard. In ten instances the estimates were below 500,000 and the counts above that figure. (These counts were 1,170,000: 600,000: 930,000: 670,000: 615,000: 560,000: 700,000: 580,000: 740,000 and 560,000.)

There were two spreaders.

Of the 90 specimens on which duplicate estimates were made there were but three which made a change in relation to the 500,000 limit. Two of these were in the nature of corrections of errors noted above, making estimates above 500,000 for the samples which gave counts of 1,170,000 and 740,000.

There were in the original 115 estimates, eight estimates of 500,000, of which the counts showed seven above and one below that figure. The 90 duplicate estimates also gave eight of 500,000 of which the counts showed seven above and one below that figure.

As shown in the tabulation on page 693 all the workers agree on results, in relation to the 500,000 limit, on 22 out of the 30 samples examined.

There were two other samples where all who made reports agreed but count of one worker was lost by spreaders (leaving but 113 counts reported). Of the remaining six samples but one worker disagreed on five as shown below:

Sample 14, all agreed on count above 500,000 excepting D who reported 280,000
Sample 17, all agreed on count above 500,000 excepting B who reported 475,000
Sample 19, all agreed on count above 500,000 excepting A who reported 417,000
Sample 21, all agreed on count above 500,000 excepting D who reported 260,000
Sample 24, all agreed on count below 500,000 excepting C who reported 560,000

On the other sample No. 9, three reported counts above 500,000 and two below that figure. The average count was 564,000.

Assuming the count agreed upon by the majority to be the correct count for the sample there were two errors on sample 9 and one each on the other five, making a total of 7 out of 113 determinations or about 6 per cent. These errors were slight, the counts in question varying from 260,000 to 560,000.

A study of duplicate counts made on these same plates by other workers shows no change of the relation to the 500,000 limit in 104 out of 115 determinations.

Of the eleven remaining determinations six were rejected by the second worker as spreaders and two were lost through an accident, the plates being broken; in three only was the count changed.

Sample 19 was reported by B at 560,000 while A reported from a count of the same plates 485,000, while in

A COMPARISON OF ACTUAL REPORTS ON THIRTY SAMPLES.

(Without consideration of the 500,000 limit.)

Sample No.	Average count.	A.	B.	C.	D.	E.
1.	4,498,000	4,000,000	4,800,000	8,000,000	2,690,000	3,000,000
2.	22,000,000	17,000,000	33,000,000	20,000,000	8,500,000	11,500,000
3.	17,440,000	12,500,000	22,000,000	30,000,000	12,700,000	10,000,000
4.	64,700,000	79,000,000	32,000,000	60,000,000	52,500,000	50,000,000
5.	18,120,000	35,000,000	22,000,000	10,000,000	14,600,000	9,000,000
6.	2,814,000	2,100,000	3,800,000	6,000,000	1,000,000	1,170,000
7.	39,540	4,400	50,000	46,000	42,000	15,700
8.	21,600	22,500	15,000	29,999	26,500	15,000
9.	564,000	600,000	930,000	270,000	670,000	350,000
10.	2,130	1,900	2,400	2,500	1,900	1,950
11.	159,000	142,000		84,000	190,000	220,000
12.	2,302,500	2,420,000		2,500,000	2,600,000	1,690,000
13.	2,000,000	2,550,000		1,850,000	2,100,000	1,500,000
14.	1,367,500	2,350,000		1,390,000	280,000	1,450,000
15.	254,750	375,000		144,000	200,000	300,000
16.	75,033	72,100	84,000		69,000	
17.	813,333	615,000	475,000		1,350,000	
18.	69,333	66,000	60,000		82,000	
19.	559,000	417,000	560,000		700,000	
20.	337,500	sp	425,000		250,000	
21.	501,666	865,000		260,000	580,000	
22.	9,666,666	6,500,000		12,000,000	8,700,000	
23.	737,500	735,000		sp	740,000	
24.	247,500	230,000		560,000	200,000	
25.	52,000,000	71,000,000		43,000,000	42,000,000	
26.	2,800,000		2,400,000		3,500,000	2,500,000
27.	150,333		180,000		167,000	86,000
28.	11,266,666		12,300,000		15,000,000	6,500,000
29.	26,066,666		38,000,000		19,000,000	21,200,000
30.	10,866,666		10,500,000		16,900,000	5,200,000

TAKEN FROM THE PRECEDING TABLE TO SHOW THE PERCENTAGE RELATION OF COUNTS OF INDIVIDUAL WORKERS TO THE AVERAGE COUNT.

Sample No.	A.	B.	C.	D.	E.
1.	.88	1.06	1.77	.59	.66
2.	.77	2.40	.90	.38	.52
3.	.71	1.26	1.71	.72	.57
4.	1.22	1.26	.92	.81	.77
5.	1.93	1.21	.55	.80	.49
6.	.74	1.35	2.13	.35	.41
7.	1.11	1.26	1.16	1.06	.39
8.	1.04	.69	1.34	1.22	.69
9.	1.06	1.64	.47	1.18	.62
10.	.88	1.12	1.17	.88	.91
11.	.89		1.52	1.19	1.38
12.	1.05		1.08	1.12	.72
13.	1.27		.92	1.05	.75
14.	1.71		1.01	.20	1.06
15.	1.47		.57	.78	1.17
16.	.96	1.11		.91	
17.	.75	.58		1.65	
18.	.95	.68		1.35	
19.	.74	1.00		1.43	
20.		1.25		.74	
21.	1.72		.51	1.15	
22.	.67		1.24	.87	
23.	.99			1.00	
24.	.92		2.26	.80	
25.	1.36		.82	.80	

26.		.85		1.25	.89
27.		1.19		1.11	.57
28.		1.09		1.33	.57
29.		1.45		.72	.81
30.		.96		1.54	.47
Totals	25.99	23.59	21.05	28.98	14.42

Division of Totals by Number of Tests to Show Average of Individual Workers.

A. 24)25.99(1.07
B. 20)23.59(1.17
C. 19)21.05(1.10
D. 30)28.98(.96
E. 20)14.42(.72

Deductions from Preceding Tables Showing Relation of Count of Individual Workers to Average Count.

Relation to average count.	A.	B.	C.	D.	E.	Totals.	
Within 10%	7	4	5	4	2	22	
Between 10 and 20%	4	5	3	11	3	26	
Between 20 and 30%	7	5	1	6	3	22	
Between 30 and 40%	2	2	1	2	4	11	
Between 40 and 50%	1	2	4	2	4	13	94
Between 50 and 100%	3	1	3	5	4	16	
Over 100%	1	2				3	19
Totals	25	21	17	30	20	113	113

sample 21 A and E report from the same plates 865,000 and 315,000 and D and B report 580,000 and 490,000. Each of these reports was based upon findings from four plate counts.

Ninety-four reports out of 113 or 83 per cent. agreed within 50 per cent. of the average count for the sample. In only three, a little over 2 per cent. was the variation more than 100 per cent.

A comparison of reports from duplicate counts made in the same manner as the preceding table showing relation of individual count to average count is also most interesting and shows practically the same results.

There were 115 results checked up by a second worker recounting the other's plates and passing in an independent report. Of these there were six spreaders and two counts lost, leaving 107 on which reports were made. The relation of the duplicate report to the original is shown below. Each report is based upon four plate counts.

Within 10%	38	
Between 10 and 20%	34	
Between 20 and 30%	15	
Between 30 and 40%	7	
Between 40 and 50%	11	98
Between 50 and 100%	6	
Over 100%	3	9
	107	107

Ninety-eight out of 107 reports or 91 per cent. are within 50 per cent. of the original. Only three show over 100 per cent. difference and the count on these three samples was in the millions per cc.

Conclusions.

Incubation of milk plates for 48 hours, rather than for 24 hours, is advisable, since, on an average, the count is doubled or trebled.

The use of meat extract media for milk counts should be abandoned,

since it gives lower counts, and also because the colonies are much smaller than with media made from fresh beef juice. The old standard medium adopted after careful experiments should be used until replaced by one giving higher average counts.

A preliminary microscopic estimate of the number of bacteria in a milk sample by the smeared sediment method is advisable,

1. To rule out specimens of low bacterial content on which no further work need be done.

2. To judge the proper dilution for specimens which must be plated.

Such an estimate as compared with plate counts presents an error of less than 10 per cent. in judging whether samples are above or below a certain standard, and the counts where this error occurs are very close to the figure determined upon for a criterion.

The reports of various workers upon the bacterial content of milk samples, as to whether they contain more or less bacteria than allowed by regulation, agree very closely, the error being about 6 per cent. Here also the error is almost negligible the counts reported erroneously approximating very closely the figure which the regulation established as a limit.

The actual reports of various workers upon these samples indicate that the ordinary bacterial count of a milk sample is reasonably accurate.

The writer wishes to acknowledge his indebtedness to Prof. James O. Jordan, Milk Inspector of Boston, and to Dr. Philip Castleman, Dr. Karl Bailey, Dr. E. J. O'Donoghue and Mr. Wm. Campbell of the Boston Health Department laboratory force for their coöperation in this series of tests.

◆

RED CROSS CREATES SANITARY SERVICE BUREAU.

The Red Cross authorizes the following:

Following its policy of caring for the health not only of the soldiers and sailors of the United States, but as well that of the civil population, the American Red Cross has established a bureau of sanitary service, which will supplement and assist Federal, State, and local health authorities in meeting sanitary emergencies created by the war. The work of the bureau will center in the civilian areas surrounding Army cantonments.

While sanitary control of National Army cantonments, National Guard camps, and naval bases will be exercised by the military authorities the districts immediately adjoining these camps will be under no such jurisdiction. Yet the assembling of large bodies of troops will create new sanitary conditions. These must be met to safeguard the health of civilians as well as of soldiers.

The problem of milk supply, for example, will be greatly enlarged. The supply itself must be doubled and sometimes trebled, and this means increased forces for inspection. In the Southern States, where malaria is a danger, the Red Cross has already undertaken efforts looking toward the extermination of mosquitoes. They must be eliminated not only in the camps proper, but in the surrounding country. Cleaning up pools and other breeding places within a mile radius of camps will mean covering from 15 to 60 square miles.

W. H. Frost, surgeon of the Public Health Service, has been assigned by the Surgeon General, at the request of the Red Cross war council, as director of the bureau of sanitary service. Dr. Frost is one of the leaders of his profession and has had wide experience extending over 13 years in the Public Health Service.

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A SYNOPTIC REPORT ON A COMPARATIVE SANITARY SURVEY OF TWO MASSACHUSETTS CITIES.

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Sanitary surveys of towns and cities have often been made, and with excellent results, but as far as I am aware no strictly comparative sanitary study of two or more towns has hitherto been attempted. My attention was drawn to this fact by Prof. W. T. Sedgwick of the Massachusetts Institute of Technology, with the suggestion that I should undertake such an investigation as a thesis for the Master's degree in the Department of Biology and Public Health.

The sanitary survey is a relatively recent undertaking. Perhaps the best known surveys are those made by Franz Schneider, Jr., of the Russell Sage Foundation in New York City, and those by the officers of the U. S. Public Health Service. These investigators have visited cities of different sizes, in different climates, of different industrial pursuits, or composed of different races, and have studied carefully the factors affecting the health of a single community. Such a survey bears somewhat the same relationship to a body politic as a physical examination bears to the body of an individual.

Some attempts have also been made to compare the health activities of municipal and state departments of health by the questionnaire method, but such information gives comparatively little knowledge of the conditions of the public health in the various communities. Vital statistics have also been employed to advantage as an index of health conditions in various communities and have been used as a basis of comparison. But these have their full significance only when linked to a knowledge of the biological activities and environmental conditions of environment found in the communities under consideration.

It was, therefore, determined to make a detailed comparative study of two cities in which a careful examination of the vital statistics should be correlated with complete sanitary surveys. In order to make a promising choice of cities for comparison, those in the state of Massachusetts in 1915 having populations of 10,000 and over were subjected to a kind of reconnaissance. In the first place the death-rates for all such cities for a number of years were tabulated. It was important to choose two cities not too distant from each other, so that the people would be under the same climatic conditions. It was also desirable to avoid cities that might be suburbs of Boston, because the residents of suburban communities spend much time in the metropolis and hence are subject to the numerous influences of that city. As a rule suburban communities simply serve as residential places for those who work in the city. Hence these do not afford the same problems in public health that the city does.

* The expense of publishing this article is borne by the Sanitary Research Laboratory of the Massachusetts Institute of Technology.—Editor.

The two cities to be compared should if possible have about the same population and age distribution, and about the same race distribution. At the same time, they ought to differ in death-rates or other respects in order to afford a real problem which the investigator should attempt to solve. Eventually a number of cities were coupled and the predominating industries for each obtained from the 1910 Census. Finally, after careful consideration, Quincy and Taunton were chosen for the comparative study in view. Here were two cities of similar population and age distribution, yet differing in predominating industries and in race distribution. Taunton had high death-rates—partly explainable by the Taunton State Hospital for the Insane—whereas Quincy had low death-rates. Taunton had high infant mortality-rates and Quincy comparatively low rates. Hence there appeared to be problems enough to solve, and upon these the entire investigation aimed to throw light. The data compiled and considered in addition to the vital statistics are given below, with an indication in each case of the results of the work.

The present communication is synoptic only. The complete thesis is on file in the archives of the Department of Biology and Public Health of the Massachusetts Institute of Technology, where it may be consulted.

Method of Attack.

After tubulating the populations and death-rates since 1900, for every city in Massachusetts whose population in 1915 was at least 10,000, the cities having similar populations were grouped together. Knowledge of the predominating industries for these cities was obtained from the 1910 Census. After careful consideration the list of possible selections was limited to six. Further study of the census statistics, location, size, predominating industries, etc., showed that Taunton and Quincy would serve best for comparison.

The next step was to make a complete and thorough study of the vital statistics since 1890. To do this, it was necessary to consult original death certificates, and the records of the Taunton State Hospital for the Insane, besides the Massachusetts State Registration Reports. The most recent annual reports of both cities were carefully studied before field work was begun Other relevant literature was also consulted.

Having completed the preliminary office studies, I began a series of frequent visits to both cities, studying carefully local conditions and collecting fundamental data. About one month was thus spent in each city. The work consisted essentially of inspections, investigations and interviews with officials, farmers, factory superintendents and other people in some way associated with the problem under consideration. The data so collected were immediately put in writing, and comparisons made with previous observations. Shortcomings were thus recognized early and rectified. Eventually all data were correlated and compared and the results tabulated.

Acknowledgments.

I desire to express particular thanks

to Prof. W. T. Sedgwick for his numerous suggestions and his aid; to Prof. S. M. Gunn for his interest and criticisms; to Prof. C. F. Park for making possible the industrial hygiene studies in Taunton; to Dr. M. E. Champion for his aid in Quincy; to the Boards of Health, the principals of the schools, the Associated Charities, the various factory superintendents, and all others in Quincy and Taunton who in any way assisted in making this work possible.

COMPARATIVE RATINGS OF HEALTH WORK IN QUINCY AND TAUNTON, MASS. USING DR. C. V. CHAPIN'S STANDARD SCORE CARD AS THE BASIS FOR COMPARISON.

			Standard.	*Quincy.*	*Taunton.*
Communicable Diseases	Medical Inspection				
	Nursing		100	0	0
	Hospitalization		50	0	0
	Antitoxin Administration		50	20	20
	Immunization				
	Venereal Diseases		20	0	0
	Ophthalmia				
	Tuberculosis	Nurses	60	20	20
		Dispensaries	40	20	20
		Hospitalization	40	5	5
Child Hygiene	School Inspection		80	50	35
	Infant Mortality	Nurses	80	0	0
		Supervision of Midwives	10	0	0
		Boarding Houses	5	5	0
		Milk Stations	5	0	0
		Consultations	20	0	0
		Prenatal Clinics	10	0	0
Sanitation	Privy Sanitation		110	90	30
	Housing		20	15	10
	Plumbing		10	8	8
	Nuisances		10	7	7
	Fly and Mosquito Control		10	0	0
	Garbage Removal		0	0	0
	Clean-up Campaigns		0	0	0
Food	Adulteration		0	0	0
	Sanitation		10	0	0
Milk	Adulteration		0	0	0
	Sanitation		20	5	0
Care of Sick Poor			50	15	10
Laboratory			50	0	0
Education			80	10	10
Vital Statistics			60	15	15
Totals			1,000	285	200

The above comparative rating shows that the health work in Quincy and Taunton is about on the same plane. Yet there exist several striking differences in the vital statistics of the two cities. Taunton has a high infant mortality-rate, a high crude death-rate, and high specific death-rates for certain diseases. For the same items, Quincy's record is much better. All this is true in spite of the fact that Quincy's birth-rate has always been either equal to or greater than that found in Taunton; and in spite of the fact that the age distribution of the people in Quincy is approximately similar to that found in Taunton, ac-

cording to the 1910 Census figures. We must, therefore, look elsewhere for explanations.

And certain striking differences are at once observed. The race distribution of the people in Quincy differs from that in Taunton. Quincy's population is composed of Finns, Swedes, Scotch, Irish, Italians and Russians, besides the native-born American stock. Taunton's population is composed of Portuguese, Polish, French Canadian and Irish, exclusive of Americans. Yet there is no reason to believe that the differences in races, *per se*, have any marked effect on the infant mortality-rates or the specific death-rates.

Women in the Industries.

Another very evident difference lies in the nature of the industries. Taunton has cotton mills and stove works, machine shops, oil cloth factories, silver and copper factories, wool stock works and dye works. Quincy has two main industries—granite works and quarries, and large shipbuilding yards. At least one other industry in Quincy is large and deserves to be mentioned. It is the manufacture of rivets and studs. But all the industries in Quincy are of such a nature that male labor is almost entirely employed. Women could not very readily find occupation in quarries or stone works or ship yards. In Taunton, the conditions are different. The large number of cotton mills furnish occupation for several thousand women of all ages, regardless of marital condition and the employment of women in industry has a very marked effect on the infant mortality-rate in any community. With this evil generally go many more, as boarding infants out, poor housing conditions, poverty, ignorance, lack of breast feeding, lack of care and attention to the infant and other factors of less importance. In Quincy, on the other hand, the women are compelled to stay at home, to give all their time and attention to the children and to their homes. It is this difference which probably gives the key to the extreme variation in infant mortality-rates in the two cities.

Wages and Hours of Employment.

In the comparison another difference is made evident. Quincy workers are paid more and work fewer hours during the day than do the workers in Taunton. This enables the Quincy workers to tide over dull seasons more comfortably and with less privation. Just how much effect this condition has on the health of the people cannot be definitely determined as it is so difficult to actually measure the value of this factor without complicating it with others. But that it has some effect will not be denied.

Industrial Hygiene and Sanitation.

Industrial conditions are worse in Taunton from the health standpoint. The undesirable and detrimental conditions of dusts, fumes, poor light, poor ventilation, temperature, humidity and unguarded moving parts of machinery are very much more prevalent there. Although the Quincy granite cutters work almost always in the presence of large amounts of granite dust, they are very frequently in the open air, and are never subjected to high temperatures

and low or high humidities in closed rooms. It appears that the specific death-rates for pneumonia and tuberculosis are very much higher in Taunton, and this is true in spite of the fact that the Quincy granite workers are always engaged in atmospheres containing stone dust. Apparently the conditions of air supply, temperature and humidity constitute very important factors which must be considered when the dangerous effects of dusts on the health of workers are weighed.

Water Supply.

The water supply in both cities is of excellent quality and is well protected against serious pollution or infection.

Sewerage and Sewage Disposal.

In this field Quincy is also further advanced than Taunton. Quincy is almost entirely sewered and the toilets are almost always connected with the sewers. The sewage is also discharged at a point where at present no nuisance or danger to health is created. Taunton, however, still has to complete a goodly portion of its sewerage system and there exist a great many privies which as a rule are very poorly kept. The open privies constitute an important health problem which should be remedied by the installation of water closets, and by the better protection and care of those privies where sewers are not yet laid. The present method of sewage disposal in Taunton also causes a serious nuisance which will have to be remedied by scientific treatment in the near future.

The Milk Supply.

Because of the fact that a large company sells and distributes pasteurized milk in Quincy, and because Quincy permits the sale of milk in the closed bottle only, Quincy's milk supply may be said to be better than that of Taunton. Except for these two differences, the milk supply in Quincy is on the same low level as that in Taunton.

Housing.

Viewing this problem broadly, it may be said that housing conditions are better in Quincy for the laboring classes. The main advantage that the Quincy houses have over those in Taunton lies in the fact that water closets are installed in almost every home in Quincy, whereas outside privies are very numerous in Taunton. As regards overcrowding and light and ventilation of the houses, nothing very definite is known and hence no comparison can be made. The statement at the head of this paragraph is based upon a general impression obtained in the surveys, from a limited investigation in Quincy and from a housing investigation made in Taunton.

School Hygiene and Sanitation.

School sanitation is undoubtedly better in Quincy than in Taunton. School hygiene, on the other hand, is about on the same level in each city. Because of the employment of a very active school nurse by the City of Quincy, the school hygiene work in that city may be rated a little higher. Both cities devote a good deal of time and effort to determine and remedy eye, ear and dental defects. The school nurse in Quincy, moreover, is attacking the problem of pediculosis.

She also visits the homes of the children and is thus able to do a good deal of educational work.

The Associated Charities.

The Associated Charities in Quincy are larger, better organized, and appear to co-operate more fully with the other welfare agencies, than is the case in Taunton.

Drunkenness.

There are about twice as many arrests made in Taunton for drunkenness as are made in Quincy for the same cause. Hence drunkenness appears to be very much more prevalent in Taunton than in Quincy. The greater use of alcohol in Taunton, if it be a fact, undoubtedly affects the health of the people and the infant mortality-rate, but how large this effect is cannot be ascertained even approximately.

Garbage Collection and Disposal.

Taunton operates a city piggery and disposes of its garbage in that fashion. Quincy sells its garbage to farmers for the feeding of pigs. Ashes and other refuse matters are generally dumped.

Climate.

Quincy is situated about ten miles southeast of Boston, Taunton about twenty-five to thirty miles south. A study of the climatological data prepared by the Weather Bureau of the United States Department of Agriculture for the New England Section, shows that the counties which include Taunton and Quincy are subject to the same atmospheric conditions. The temperatures are approximately the same in both places. The precipitation is also about the same, and to all intents and purposes, it may be said that the climate of Quincy and Taunton is similar. Quincy, however, lies immediately on the coast, whereas Taunton is situated about thirty miles inland. Quincy is hilly and rocky, whereas Taunton is mostly flat country.

Conclusions.

A comparative study of these two cities has proved that health conditions in Quincy at present appear to be superior to those in Taunton. The factors that appear to be particularly significant in composing this difference may be tabulated as follows:

1. The greater amount of ignorance—lack of education and lack of knowledge of American customs and manner of living and lack of ability to speak English—among the population of Taunton.
2. The employment in Taunton of women in industries, and particularly married women.
3. Longer hours of work.
4. Poorer wages.
5. The greater number of industrial hazards in Taunton's industries.
6. The excessive use of alcohol.
7. The prevalence of many open and unprotected privies.
8. On the other hand, in the case of diphtheria the statistics seem to be more favorable in Taunton than in Quincy.

TABLE I.
VITAL STATISTICS TAUNTON, MASS.

Year.	Population.	Deaths.	Death-rate.	Total deaths minus non-resident insane deaths.	Corrected death-rate.
1891	25,781	445	17.3		
1892	26,114	595	22.8		
1893	26,447	575	21.7		
1894	26,780	574	21.4		
1895	27,115	497	18.3		
1896	27,899	587	21.0		
1897	28,683	607	21.1		
1898	29,467	576	19.5		
1899	30,251	671	22.2		
1900	31,036	667	21.3		
1901	31,022	565	18.2		
1902	31,008	568	18.3		
1903	30,994	653	21.1		
1904	30,980	637	20.6	517	17.2
1905	30,967	679	21.9		
1906	31,655	632	19.9	518	16.9
1907	32,313	731	22.6	638	20.3
1908	32,971	670	20.4	547	17.1
1909	33,629	720	21.4		
1910	34,259	810	23.6	695	20.9
1911	34,639	715	20.6	579	17.2
1912	35,020	751	21.4	601	17.6
1913	35,400	701	19.8	573	16.6
1914	35,781	801	22.4	612	17.6
1915	36,161	826	22.8	685	19.5

TABLE II.
TAUNTON, MASS.

Year.	Population.	Births.	Birth-rate.	Infant deaths.	Infant mortality per 1,000 births.
1890	25,448	671	26.3		
1891	25,781	704	27.4		
1892	26,114	714	27.3		
1893	26,447	776	29.4		
1894	26,780	663	24.8		
1895	27,115	718	26.4		
1896	27,899	765	27.4		
1897	28,683	696	23.9		
1898	29,467	772	26.2	109	141
1899	30,251	728	24.0	133	183
1900	31,036	788	25.4	161	204
1901	31,022	835	26.9	103	123
1902	31,008	756	24.4	93	123
1903	30,994	779	25.1	118	152
1904	30,980	811	26.2	126	155
1905	30,967	810	26.2	152	187
1906	31,655	885	27.9	142	160
1907	32,313	909	28.1	129	142
1908	32,971	961	29.2	146	152
1909	33,629	887	26.3	150	169
1910	34,259	956	27.9	203	212
1911	34,639	1020	29.4	160	157
1912	35,020	920	26.2	157	171
1913	35,400	931	26.2	138	148
1914	35,781	966	27.2	119	123
1915	36,161	978	27.1	152	155

TABLE III.

DEATHS FROM SPECIAL CAUSES IN TAUNTON, MASS.

Year.	Measles.	Scarlet fever.	Diphtheria.	Whooping-cough.	Typhoid fever.	Dysentery.	Diarrhea, all types.	Tuberculosis.	Pneumonia.	Bronchitis	Apoplexy.	Accident.	Alcoholism.
1890													
1891	—	1	9	—	3	8	29	62	35	13	18	15	—
1892	—	8	12	—	9	2	33	61	67	24	16	20	2
1893	2	10	8	3	7	4	43	43	62	13	17	18	8
1894	—	3	55	5	8	2	25	73	40	17	20	15	3
1895	—	1	29	—	2	—	22	52	35	13	20	18	1
1896	—	—	14	2	7	4	37	74	58	16	15	17	3
1897	1	5	9	1	8	1	29	63	62	18	22	13	1
1898	—	1	1	—	9	4	15	66	43	13	26	22	3
1899	—	2	8	6	8	5	28	61	80	12	26	27	1
1900	10	—	4	2	8	3	50	69	73	17	21	15	4
1901	—	4	6	1	9	3	39	61	46	12	34	14	1
1902	—	1	7	7	8	4	44	61	46	9	30	18	3
1903	1	5	10	4	6	4	44	52	69	20	35	15	3
1904	—	3	5	—	1	3	47	57	89	20	41	22	3
1905	1	3	10	2	3	2	54	72	76	15	42	22	2
1906	3	—	2	10	10	5	42	64	71	21	37	17	3
1907	1	2	4	2	7	5	54	54	101	24	47	26	3
1908	2	8	1	4	7	1	59	71	68	19	48	12	3
1909	3	4	3	6	12	7	61	54	97	26	47	16	3
1910	6	1	8	1	7	3	122	47	111	17	48	34	5
1911	—	—	6	7	5	4	84	57	94	18	41	23	3
1912	4	2	4	6	1	1	72	63	111	13	37	29	4
1913	2	11	4	1	4	4	65	51	87	4	49	23	1
1914	—	7	2	6	1	1	55	73	119	14	40	23	5
1915	6	4	2	6	—	4	72	80	155	17	9	31	12

TABLE IV.

SPECIFIC DEATH-RATES FOR CERTAIN DISEASES IN TAUNTON, MASS.

Year.	Population.	Measles.	Scarlet fever.	Diphtheria.	Whooping-cough.	Typhoid fever.	Dysentery.	Diarrhea, all types.	Tuberculosis.	Pneumonia.	Bronchitis.	Apoplexy.	Accident.	Alcoholism.
1890	25,448	—												
1891	25,781	—	3.9	35.1	—	11.7	31.2	113.0	242.0	136.6	50.7	70.2	58.5	—
1892	26,114	—	30.6	45.9	—	35.4	7.6	125.3	231.2	253.6	91.3	61.2	76.0	7.6
1893	26,447	7.6	37.4	30.4	11.4	26.6	15.2	163.3	163.0	236.0	48.4	64.6	68.4	30.4
1894	26,780	—	11.2	205.2	18.6	29.8	7.5	93.0	271.8	150.0	64.8	74.4	55.8	11.2
1895	27,115	—	3.7	107.2	—	7.4	—	81.4	192.1	129.5	48.1	74.0	66.6	3.7
1896	27,899	—	—	50.2	7.1	25.1	14.2	131.2	262.1	206.0	56.8	53.2	60.3	10.7
1897	28,683	3.5	17.4	31.5	3.5	28.0	3.5	101.5	220.2	217.2	63.0	77.1	45.5	3.5
1898	29,467	—	3.4	3.4	—	30.6	13.6	51.0	224.5	146.1	44.2	88.4	74.9	10.2
1899	30,251	—	6.6	26.4	19.8	26.4	16.5	92.4	202.0	264.0	39.6	85.9	89.1	3.3
1900	31,036	32.2	—	12.9	6.4	25.8	9.6	161.0	220.8	233.6	54.5	67.6	48.0	12.9
1901	31,022	—	12.9	19.3	3.2	28.8	9.6	135.2	195.2	147.0	38.4	108.9	44.8	3.2
1902	31,008	—	3.2	22.4	22.4	24.6	12.3	135.3	195.2	147.0	28.8	96.0	57.6	9.6
1903	30,994	3.2	16.1	32.2	12.9	19.2	12.9	141.9	166.2	220.8	64.0	112.0	48.3	9.6
1904	30,980	—	9.7	16.1	—	3.2	9.7	156.4	182.6	284.8	64.0	131.1	70.5	9.6
1905	30,967	3.2	9.7	32.3	6.5	9.7	6.5	175.5	230.6	243.5	48.0	134.2	70.5	6.5
1906	31,655	9.5	—	6.3	31.5	31.5	15.7	132.2	201.6	223.7	66.5	116.5	53.6	9.5
1907	32,313	3.1	6.2	12.4	6.2	21.7	15.5	167.2	167.3	313.6	74.5	145.8	80.6	9.3
1908	32,971	6.1	24.4	3.0	12.2	21.0	3.0	177.0	213.0	204.0	57.0	144.0	36.6	9.0
1909	33,629	8.9	11.9	8.9	17.8	35.6	20.8	181.1	160.1	287.9	77.2	125.6	47.6	8.9
1910	34,259	17.5	2.9	23.3	2.9	24.3	8.7	354.0	136.2	322.0	49.3	139.1	99.6	14.5
1911	34,639	—	—	17.3	20.2	14.4	11.5	242.0	164.0	271.0	52.0	118.2	66.3	8.6
1912	35,020	11.4	5.7	11.4	17.1	2.8	2.8	205.5	179.7	317.0	37.1	105.3	82.7	11.4
1913	35,400	5.6	31.1	11.3	2.8	11.3	11.3	183.3	144.0	245.9	11.3	138.2	65.0	2.8
1914	35,781	—	19.6	5.6	16.8	2.8	2.8	153.9	204.0	333.0	38.2	111.9	63.4	14.0
1915	36,161	16.6	11.1	5.5	16.6	—	11.1	199.2	221.5	429.0	47.1	24.9	85.9	33.2

TABLE V.
QUINCY, MASS.

Year.	Population.	Deaths.	Death-rate.
1890	16,723	355	21.2
1891	17,521	292	16.6
1892	18,319	288	15.7
1893	19,117	349	18.2
1894	19,915	356	17.8
1895	20,712	326	15.7
1896	21,349	339	15.9
1897	21,986	339	15.4
1898	22,623	321	14.2
1899	23,260	357	15.3
1900	23,899	347	14.5
1901	24,744	325	13.2
1902	25,579	408	16.0
1903	26,414	362	13.7
1904	27,249	349	12.8
1905	28,076	368	13.1
1906	28,989	385	13.3
1907	29,902	389	13.0
1908	30,815	379	12.3
1909	31,728	389	12.2
1910	32,642	386	11.8
1911	34,248	396	11.5
1912	35,855	381	10.6
1913	37,461	479	12.8
1914	39,067	460	11.8
1915	40,674	552	13.6

TABLE VI.
QUINCY, MASS.

Year.	Population.	Births.	Birth-rate.	Infant deaths.	Infant mortality.
1890	16,723	560	33.4		
1891	17,521	649	37.0		
1892	18,319	613	33.4		
1893	19,117	716	37.4		
1894	19,915	660	33.1		
1895	20,712	645	31.2		
1896	21,349	713	33.4		
1897	21,986	685	31.2		
1898	22,623	776	34.2	82	105
1899	23,260	707	30.4	108	153
1900	23,899	752	31.4	81	108
1901	24,744	709	28.6	65	92
1902	25,579	745	29.2	96	129
1903	26,414	773	29.2	76	98
1904	27,249	765	28.0	77	100
1905	28,076	767	27.3	82	107
1906	28,989	850	29.4	96	113
1907	29,902	832	27.8	94	113
1908	30,815	842	27.3	95	113
1909	31,728	860	27.1	83	97
1910	32,642	874	26.7	90	106
1911	34,248	903	26.3	92	102
1912	35,855	893	24.9	73	82
1913	37,461	936	25.0	101	108
1914	39,067	1007	25.8	76	75
1915	40,674	1119	27.5	93	83

TABLE VII.
DEATHS FROM SPECIAL CAUSES IN QUINCY, MASS.

Year.	Population.	Measles.	Scarlet fever.	Diphtheria.	Whooping-cough.	Typhoid fever.	Dysentery.	Diarrhea, all types.	Tuberculosis.	Pneumonia.	Bronchitis.	Apoplexy.	Accident.	Alcoholism.
1890	16,273													
1891	17,521	2	—	4	—	5	—	25	50	18	8	13	13	1
1892	18,319	1	2	10	—	7	—	14	51	17	6	13	17	1
1893	19,117	2	6	9	—	11	—	18	50	34	14	6	18	1
1894	19,915	—	1	32	7	7	1	29	48	24	9	14	11	1
1895	20,712	—	5	16	2	7	—	19	47	18	7	10	12	1
1896	21,349	—	3	14	1	8	1	24	41	21	8	13	10	—
1897	21,986	3	2	2	—	5	4	15	38	41	8	15	13	2
1898	22,623	4	—	2	2	4	—	9	33	32	8	10	19	—
1899	23,260	2	—	9	5	9	3	23	50	25	16	15	16	3
1900	23,899	1	—	19	2	4	2	13	45	33	13	14	14	1
1901	24,744	—	—	8	5	2	1	25	38	23	8	17	12	2
1902	25,579	1	1	14	1	5	—	38	42	34	12	21	24	2
1903	26,414	1	—	11	7	2	2	22	29	31	10	12	18	2
1904	27,249	4	1	9	—	1	—	16	34	38	8	9	19	1
1905	28,076	—	3	12	—	3	—	21	40	38	6	15	17	2
1906	28,989	1	—	9	9	1	2	20	46	38	14	15	22	3
1907	29,902	1	3	6	—	—	—	30	36	41	5	19	19	2
1908	30,815	—	—	9	—	3	—	16	26	34	7	17	25	2
1909	31,728	—	—	2	1	3	—	19	42	31	1	19	30	—
1910	32,642	3	3	3	—	3	2	29	33	57	4	21	17	—
1911	34,248	1	7	7	2	2	—	29	33	33	4	19	21	3
1912	35,855	1	—	3	—	2	1	26	31	21	7	24	26	1
1913	37,461	2	—	8	5	3	—	25	34	60	6	37	33	4
1914	39,067	1	3	7	2	2	—	18	51	54	8	16	28	2
1915	40,674	2	5	4	3	2	1	31	47	45	5	6	44	3

TABLE VIII.
SPECIFIC DEATH-RATES FOR CERTAIN DISEASES IN QUINCY, MASS.

Year.	Population.	Measles.	Scarlet fever.	Diphtheria.	Whooping-cough.	Typhoid fever.	Dysentery.	Diarrhea, all types.	Tuberculosis.	Pneumonia.	Bronchitis.	Apoplexy.	Accident.	Alcoholism.
1890	16,273													
1891	17,521	11.4	—	22.8	—	28.5	—	142.5	284.0	102.6	45.6	74.2	74.2	5.7
1892	18,319	5.4	10.9	54.5	—	38.2	—	76.4	278.0	92.7	32.7	70.9	92.8	5.4
1893	19,117	10.4	31.2	47.0	—	57.5	—	94.0	261.5	177.6	73.2	31.2	94.0	5.2
1894	19,915	—	5.0	160.4	35.1	35.1	5.0	145.3	240.7	120.3	45.0	70.3	55.2	5.0
1895	20,712	—	24.1	77.3	9.6	33.8	—	91.8	226.5	82.0	33.8	48.2	58.0	4.8
1896	21,349	—	14.1	65.6	4.7	37.4	4.7	112.2	192.0	98.4	37.4	60.9	47.0	—
1897	21,986	13.6	9.1	9.1	—	22.7	18.2	64.3	172.8	186.6	36.4	64.3	58.2	9.1
1898	22,623	17.6	—	8.8	8.8	17.6	—	39.8	145.7	141.2	35.2	44.1	83.8	—
1899	23,260	8.6	—	38.6	21.4	38.6	12.7	98.8	214.4	107.2	68.8	64.5	68.8	12.7
1900	23,899	4.2	—	79.5	8.4	16.7	8.4	54.4	188.2	138.0	54.5	58.5	58.5	4.2
1901	24,744	—	—	32.3	20.2	8.1	4.0	101.0	153.4	93.0	32.3	68.7	48.5	8.1
1902	25,579	3.9	3.9	54.8	3.9	19.5	—	148.7	164.4	133.0	47.0	82.2	94.0	7.8
1903	26,414	3.8	—	41.6	26.4	7.6	7.6	83.2	113.8	117.0	37.8	45.3	68.0	7.6
1904	27,249	14.7	3.7	33.0	—	3.7	—	58.6	124.7	139.2	29.3	33.0	69.7	3.7
1905	28,076	—	10.7	42.8	—	10.7	—	74.9	142.6	135.2	21.4	53.5	60.6	7.1
1906	28,989	3.5	—	31.2	31.2	3.5	6.9	69.0	158.8	131.1	48.4	51.8	76.0	10.3
1907	29,902	3.2	10.0	20.0	—	—	—	100.0	120.0	137.0	16.7	63.5	63.5	6.5
1908	30,815	—	—	28.2	—	9.4	—	51.8	83.3	110.0	22.6	55.0	81.0	6.5
1909	31,728	—	—	6.3	3.1	9.4	—	59.9	132.2	97.8	3.1	59.9	94.6	—
1910	32,642	9.2	9.2	9.2	—	9.2	6.1	88.8	100.9	177.2	12.2	64.3	52.0	—
1911	34,248	2.8	20.4	20.4	5.8	5.8	—	84.6	96.3	96.3	11.7	55.4	61.2	8.7
1912	35,855	2.8	—	8.1	—	5.6	2.8	72.5	86.4	58.6	19.5	66.9	72.4	2.8
1913	37,461	5.3	—	21.3	13.3	8.0	—	66.7	90.8	160.0	16.0	98.7	88.0	10.7
1914	39,067	2.5	7.7	17.9	5.1	5.1	—	46.1	130.7	138.3	20.5	41.0	71.7	5.1
1915	40,674	4.9	12.3	9.8	7.4	4.9	2.5	76.4	115.6	110.7	12.3	14.7	108.1	7.4

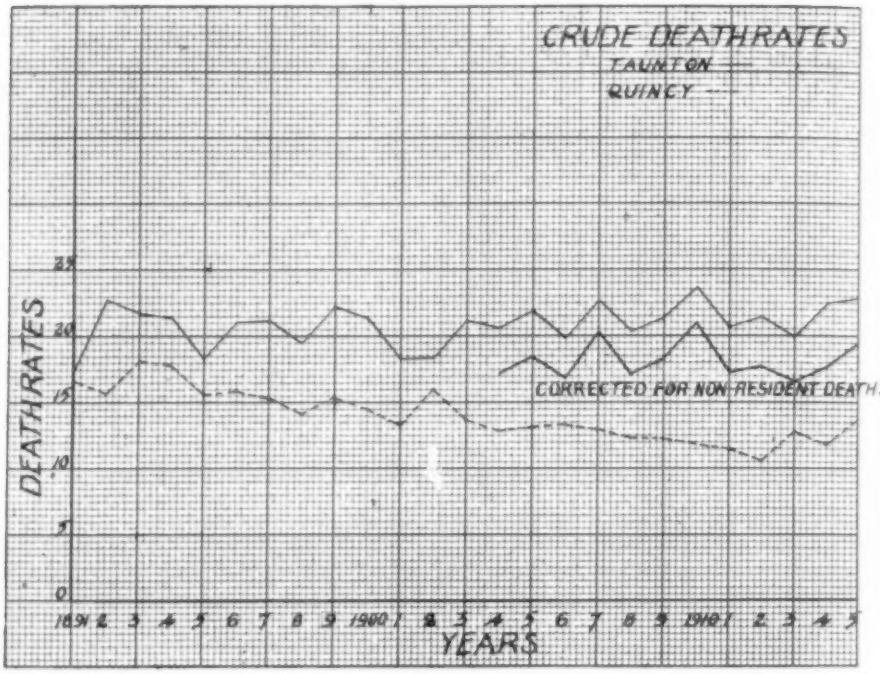

Chart I

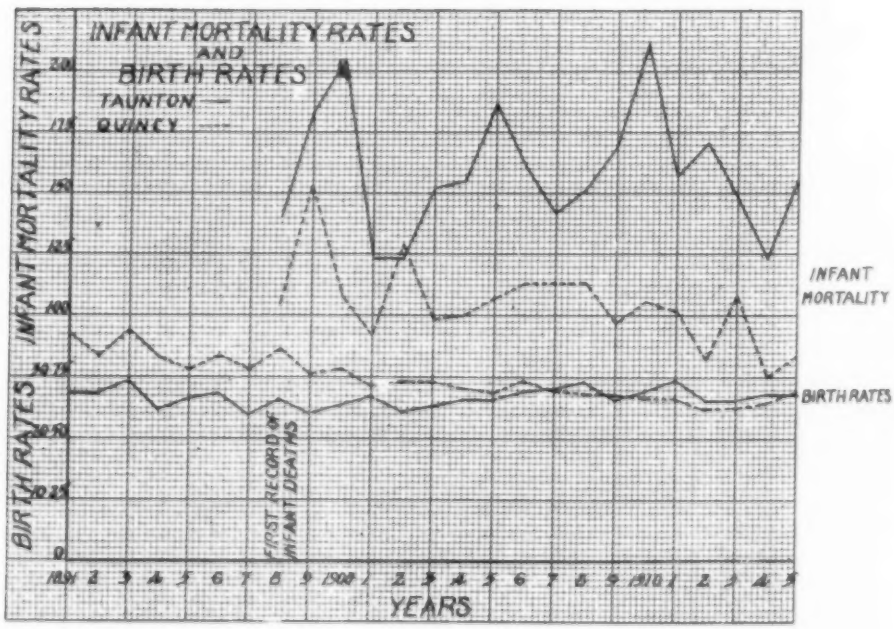

Chart II

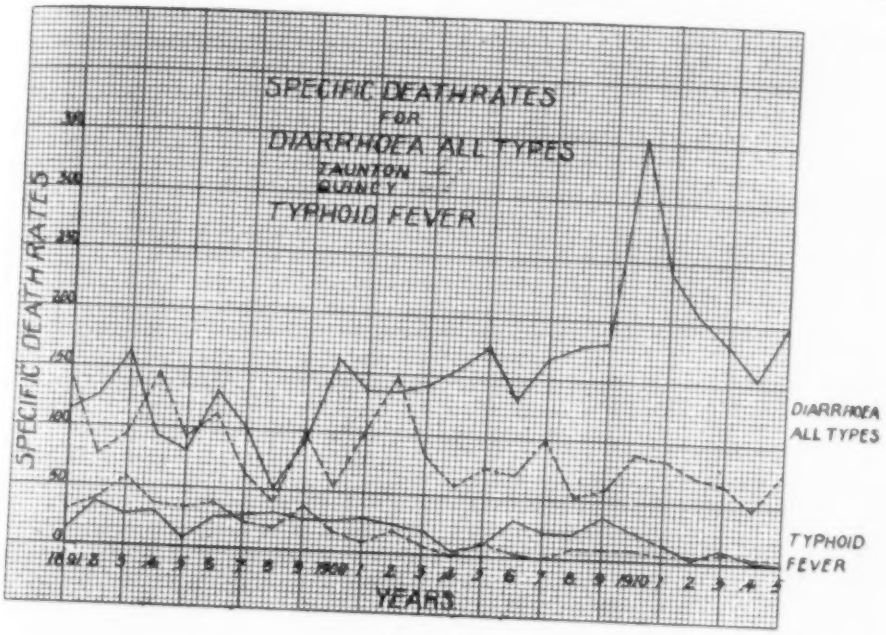

Chart III

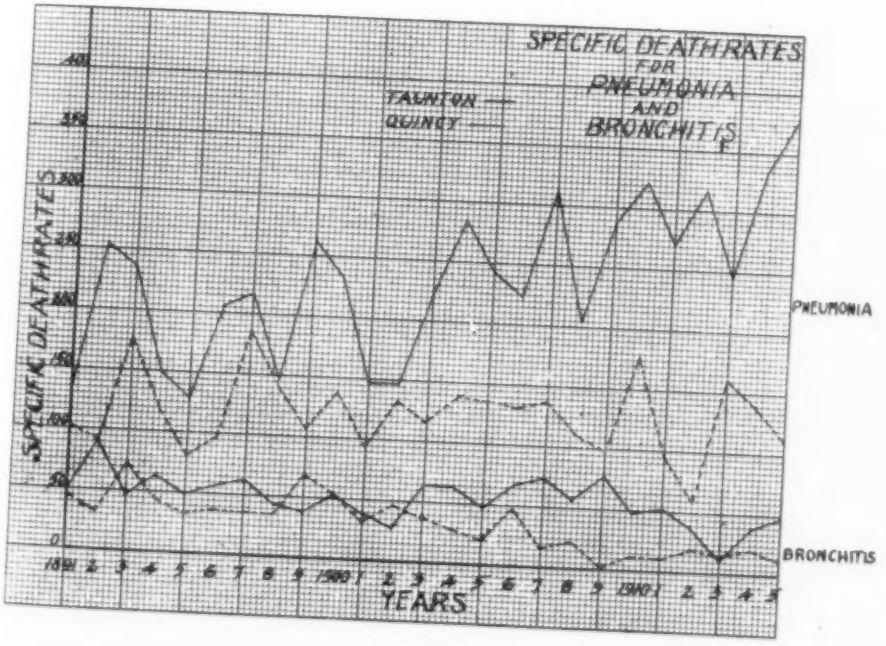

Chart IV

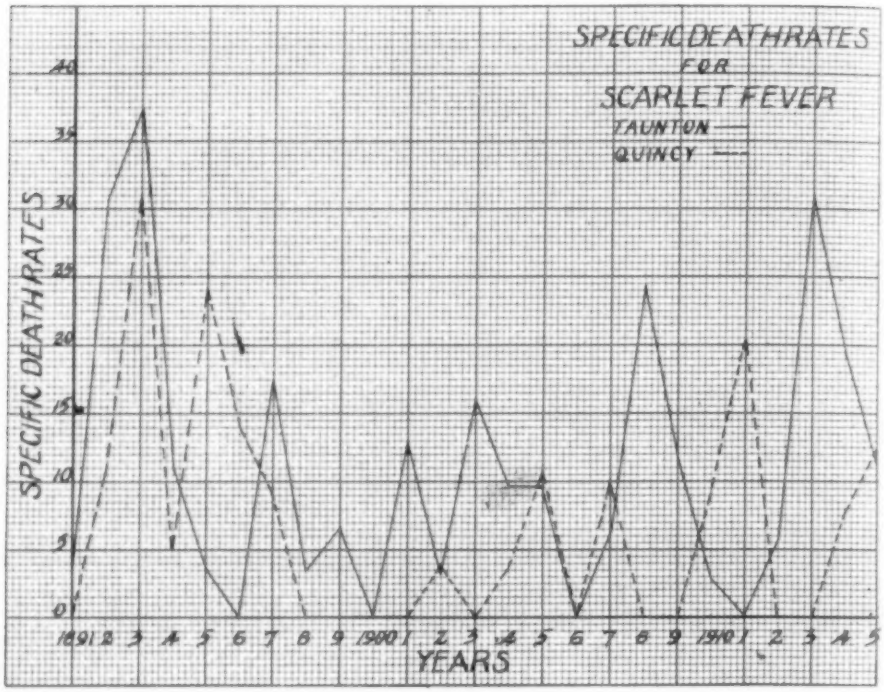

Chart V

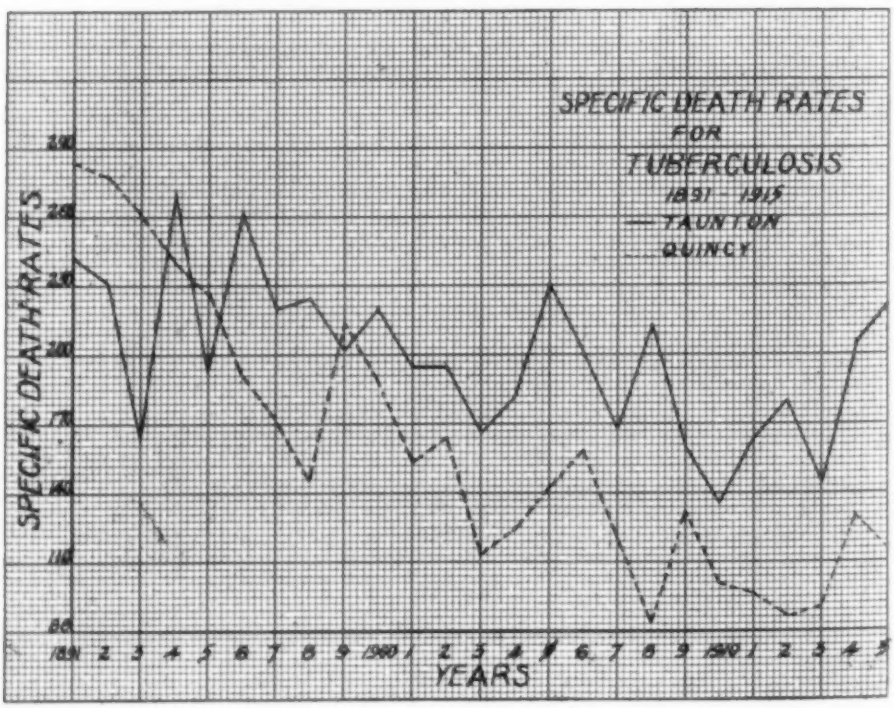

Chart VI

Book Reviews.

Mental Conflicts and Misconduct. *By William Healy. Boston: Little, Brown and Company, 1917. Pp. XI+330. Price, $2.50 net.*

In this book the author presents a rich case material derived from his studies at the Juvenile Psychopathic Institute of Chicago. Starting with delinquency as a problem of conduct requiring investigation, he was led from the delinquent act and its setting far back in the life of the child to factors which had often escaped notice completely. The actual delinquent behaviour was often seen to be the result of a certain tension to which a great many factors contributed. In such cases, therefore, the delinquent act was to be looked upon more as symptomatic of mental tension requiring treatment than as a motivated purposeful act to be judged purely by ethical standards and dealt with by cut and dried legal methods.

In the frank discussion with the delinquent of his complex driving trends, the author continually was struck by the prominence of the rôle played by the sexual trends represented either by sexual experiences, or sexual curiosity, or sexual ruminations of varied origin.

The detailed cases are presented in chapters five to sixteen, dealing with delinquents presenting conflicts in which sexual interests usually play a prominent rôle, and showing such behaviour as stealing, running away and anti-social conduct of varied nature.

The practical result of this type of investigation was found to be quite important, the sympathetic review with the delinquent of the underlying factors frequently bringing to an end, at least temporarily, the delinquent conduct. The author uses this therapeutic criterion to reinforce his contention that the delinquency in many of these cases is the result of the tension in the delinquent's life due to conflicts between sexual interests and the repressing forces.

The importance of this method of approaching early cases of delinquency with the use of free associations is fully borne out by the valuable data of the book. The histories of these cases with the spontaneous accounts take us deep down to the basal biological factors at the root of their behaviour. At the same time the author formulates the causal connection in what appears to be too simple a manner. In these delinquents with their stealing, fugues, lying, etc., the sexual data are prominent. This does not, however, mean that the sexual interest or strivings or repressions are to be too closely knit up with the delinquency in a causal nexus. It is, perhaps, too simple a formulation to say that a mental conflict chiefly related to the sexual sphere causes the theft or other misdemeanor. In many cases it rather appears that the child with considerable difficulty in general adaptation, suggestible to various influences, has at the same time indulged in delinquent acts and had trouble with sex feeling. That is only what one would expect; the child of somewhat poor balance in unfortunate circumstances, who gives in to some delinquent act, shows a constitutional or acquired weakness which is also going to be the cause of trouble in assimilating any sexual suggestions or experiences.

The case records in which the delinquents themselves seem to emphasize the causal connection between sexual thoughts and strivings, and the resulting theft, are not to be taken as final evidence. There is a certain suspicious similarity of the confessions of these delinquents, which suggests an atmosphere to which they have readily responded with their precocious intuition. In these cases as with hysterical patients, there is a tendency for a school to be developed, and to have all the patients show a classical series of symptoms. In Charcot's time at the Salpêtrière the patients were expected to present a certain classical picture and they lived up to these expectations. Change of medical views led to the almost complete disappearance of the previously familiar clinical pictures.

The author himself calls attention to the easy fabrications of some of these patients, the pseudologia which is so familiar in the hysterical, the psychopathic and children. Especially in those cases where the stealing is described by the delinquent as following a bad word which tends to come into his mind, one feels it safer to reserve

his opinion. There is a danger in all such investigations of being carried away by the hunt for a universal formula which will fit all cases. The author's psychological formula corresponds somewhat to the French detective formula of "cherchez la femme."

Although one may feel that the author has generalized rather widely, the book is undoubtedly a very valuable contribution to criminology and to psychology; it is a pioneer work of very considerable importance.

C. Macfie Campbell.

The Psychology of Special Abilities and Disabilities. *By Augusta F. Bronner. Boston: Little, Brown and Company, 1917. Pp. VI+269. Price, $1.75 net.*

Of recent years much attention has been paid to the standardization of the intelligence level of children; the resultant tendency is to pay too much attention to the final score summing up the child's intelligence, and to neglect the fact that the score may absolutely conceal the great variation between the abilities of the child in different directions. The author deals especially with these problems; she discusses the problem of the child who is normal in many respects, but who shows very special disability in other respects. She also takes up the problem of the child who is subnormal on the whole, but who may show rather special abilities in one direction or another.

In her discussion of these problems the author presents many case histories and takes up in detail the psychology of learning arithmetic, of learning to read and spell, and reviews in some detail a great number of special functions. The amount of case material presented is rather large and disproportionate to the importance of the issues raised. Most workers have easily at their disposal relevant personal material, which makes such a large amount of case material unnecessary. The book would have gained considerably by condensation and by the main problem being brought to a clearer focus. For those who wish, however, a review of the various topics without any special new contribution, or solution, there is much of interest in the book. While it contributes little that is new to the psychologist, it is somewhat too detailed to be of much practical use to the teacher; for example, out of twelve pages in which reading is discussed, eight are devoted to a discussion of so-called congenital mind-blindness, which seems rather disproportionate. The general outlook of the book is sound and healthy; the author does much to counteract prevailing schematic views and to bring home the necessity of the study of the individual child, and the study of the different functions of each individual child in their independent variations.

C. Macfie Campbell.

Studies on the Digestion of a Sewage-Filter Effluent by a Small and Otherwise Unpolluted Stream. *By Robert S. Weston and C. E. Turner. Cambridge, Mass.: Massachusetts Institute of Technology.—Contributions from the Sanitary Research Laboratory and Sewage Experiment Station. Volume X. Price, $1.00.*

This volume of the "Contributions" represents, as the title indicates, a study of rapid self-purification. The river selected for the study is the Coweeset, which receives the partially purified sewage from the city of Brockton, Massachusetts, a city having a population of 64,000. The investigation was carried on by Prof. Robert Spurr Weston and Mr. C. E. Turner of the teaching staff of the Massachusetts Institute of Technology.

Thorough chemical and planktological examinations proved that the small river was able to digest the partially purified sewage of Brockton within the first three-fourths of a mile of its course. The digestion was found to be extremely sensitive to conditions such as temperature and rainfall. Detailed tabulations of the chemical and biological findings, as well as photographic reproductions and technical sketches accompany the report, which covers approximately 100 pages. The report represents a valuable contribution to the study of self-purification of polluted streams.

Too little attention has been paid heretofore in this country to the importance of plankton in the digestion process largely because such a study requires the attention of experts. A thorough planktologic analysis is laborious,

and the vast majority of sewage- and water-chemists engaged in practical work are not competent to do it. The German and English school has long recognized the extreme importance of plankton in the process of self-purification, and the valuable deductions to be drawn from qualitative and quantitative plankton analyses. It must be acknowledged, however, that an investigation, such as the one carried on by Messrs. Weston and Turner, as far as practical application is concerned, is mainly of local interest. Hardly ever are there two conditions which would be alike with reference to volume and character of sewage as well as flow and biology of receiving stream. A great many factors enter into such an investigation which make it very difficult to apply the results obtained in one locality to another. Many more such investigations should be made in various localities, and the one discussed here may well serve as guide.

Arthur Lederer.

Food Poisoning. *By Edwin Oakes Jordan. The University of Chicago Press, 1917. Pp. 107, ills. 10. Price, $1.00.*

The author, a bacteriologist of note, has, naturally, discussed the subject from the bacteriological viewpoint, nearly all the detailed treatments being of that nature. The extent of food poisoning is but little known, and the author states that it may be responsible for certain of the degenerative diseases. He subscribed to a press clipping bureau for two years and obtained records of 1,032 cases, of which 657 were groups and 375 were individual. In all, 5,238 individuals were involved. The analysis of these reports is tabulated. The validity of this method of collecting statistics may be questioned, particularly in view of the statement on page 8 that the National Canners' Association during 1916 investigated fifty-one of these "libels on the industry" and found the alleged poisoning could not be traced to canned goods, as reported.

Anaphylaxis is described in an interesting manner and a number of examples, particularly those relating to egg poisoning, are given. Poisonous plants (conium, cicuta, mushrooms), poisonous fish and poisonous minerals are briefly discussed and food antiseptics more extensively discussed, giving a review of the celebrated benzoate controversy. The author cites the possibility of the high death-rate from degenerative diseases of the kidneys, blood vessels and other organs being in part caused by the irritating qualities of these "chemical" preservatives.

Food poisoning by pathogenic bacteria is described in some detail. Typhoid infection by carrier and otherwise, asiatic cholera infection, paratyphoid infection and infection by *enteritidis*, including many examples, are given, as well as a discussion of the relation between the two latter forms of infection. The author also cites the means of avoiding these various infections.

A short chapter upon animal parasites is followed by a longer one on poisonous products formed in food, in which botulism and its bacteriology is discussed. Regarding decomposed foods in general the author thinks that there is lack of evidence as to their dangerous qualities and cites cheese, sour milk, ripened meat and Chinese "eggs" as examples of such food consumed with impunity. The book closes with a short chapter on poisoning of obscurer unknown causes, deficiency diseases and a summary of foodstuffs most liable to cause infection or sickness.

The book is written in good English in an entertaining and concise manner.

Hermann C. Lythgoe.

Standard Methods for the Analysis of Water and Sewage. *Third Edition. 1917. Thoroughly revised. Obsolete methods dropped. Many new methods added. Send $1.25 to American Public Health Association, 126 Massachusetts Ave., Boston.*

Health Department Reports.

Montclair, New Jersey.

With the exception of the epidemic of infantile paralysis, the health conditions of this city of 25,000 population were very satisfactory during 1916 as set forth by the Twenty-second Annual Report of the Montclair Board of Health. The number of cases reported of diphtheria, scarlet fever, and typhoid fever were low, and there resulted only four deaths during the year from these diseases in addition to measles and whooping cough. Of the 272 deaths, 90 were caused by organic diseases of the heart, Bright's disease, cerebral hæmorrhage, and diseases of the arteries, which is the largest number in any one year thus far reported, and represents an increase of 30 per cent. over the number from like causes five years ago. Over 9 per cent. of the deaths were due to cancer, an increase of 100 per cent. in the last fifteen years. The corrected death-rate was 10.56 per 1,000 inhabitants. In this connection it is interesting to note that the reader is warned that the comparison of the crude death-rates of two different communities does not produce a fair comparison of the relative sanitary conditions of the two cities, and that a true comparison can only result from a study of the causes of death, in conjunction with the ages at which the deaths occurred.

The number of cases of infantile paralysis reported in Montclair numbered 32, or 1.24 cases per 1,000 inhabitants. Careful study was made of the incidence of poliomyelitis, and though much of what was discovered has previously been reported, the account here given well demonstrates the zeal and thoroughness of this town's investigation. It is interesting to note that as a result the Board of Health feels that many of the precautionary measures in the matter of quarantine, etc., instituted during the recent epidemic are unnecessary and ineffective, and will not be enforced during the present year if like circumstances prevail. The expenses of the epidemic amounted to nearly 40 per cent. of the entire expenditures for the department during the year. It is well to know that in the light of last year's experience any future circumstances of this nature will not cause such a drain upon the department's finances.

There were only eight cases of typhoid fever reported, with no deaths, during the year, and of these eight, five cases were traced to out-of-town sources of infection. The number of cases of measles reported was the second largest in the history of the town. It is unfortunate that in this connection the department believes that "it is next to impossible to control it," since somewhat recently it has been demonstrated that the course of the disease can at least be curbed by the careful observance of the children during the first hour of school for any initial symptoms, especially for any rise of temperature, and upon that basis the child to be excluded for the day. Malarial incidence continued low, only seven cases being reported. There were 78 cases of tuberculosis reported, an increase over the previous year of 8 cases, the increase being due to the larger number of non-pulmonary cases, due to the fact, it is believed, that it is only recently that these cases have been reported with any degree of completeness. Some 30 per cent. of these cases were under 15 years of age. Because of the large number of cases in which there has been direct infection of a child from another case in the same family, the attempt has been made to enforce the regulation that children under 16 years of age shall not live in an apartment in which there is a case of tuberculosis unless every precaution is taken to prevent any possible transfer of the infection. There were 27 deaths from this disease. Considerable incidence from whooping-cough and chickenpox was reported.

The infant mortality rate was 61 per 1,000 births, the lowest on record. Exclusive of the colored and Italian population of the town, the rate would amount to only 40. While no doubt many factors have been at work to obtain this most creditable rate, there seems to be no question but what the different activities of the Board

have been responsible for a large share of this conservation of infant life.

Believing that if terminal disinfection were abolished many parents would be careless long before the danger period was over, this town has adhered to the policy of room disinfection in the case of all communicable diseases, though there seems to be a letting-up of this practice in the case of scarlet fever.

The supervision of milk and cream has still retained its excellence, and the ordinances previously made have thus far proved sufficient.

The style of this report can be greatly commended. It well accomplishes its purpose to the people, and it is well to note that much of the superfluous matter found in many such reports is omitted. The financial statement deserves special commendation, for the appearance of such a statement in the form of functional items is a departure one is pleased to note in the reports of cities and towns of this size.

Province of Nova Scotia.

The Twenty-fourth Annual Report of the Department of Public Health of the Province of Nova Scotia, October 1, 1915–September 30, 1916, is the report of a territory comprised of two cities, Halifax and Sydney, thirty-five towns, and twenty-four municipalities, with a 1915 population estimated at 503,162, two thirds of which is accredited to the rural districts.

Throughout the text of this report,—and it is equally evident in many other Canadian reports—we cannot help but notice the unfortunate decrease in the efficiency of community health supervision. Either many of the physicians who formerly interested themselves in health work have gone "over-seas," or, if their work has proven of good quality, they have been called to fill positions with the troops and camps in Canada. The results incident to this unfortunate, though doubtless necessary, policy are obvious, and naturally the civic population must suffer correspondingly. Yet in spite of this we note in some instances a definite decrease in disease incidence. It is possible that the withdrawal of many public health workers from their civic duties has been more or less neutralized by the education and growing realization of the value of personal hygiene and community sanitation by the populace, particularly in the rural districts.

Only for the last two years have morbidity returns been made of the more common infectious diseases, and it is felt that these are too inexact to be of real value for purposes of comparison. However, death returns are available over a longer period, and the present death returns indicate that the death-rate for this Province is increasing. The general death-rate for 1915 is reported as 17.5 per 1,000 inhabitants for the cities and towns, and a rate of 13.7 for the rural districts. The deaths due to pulmonary tuberculosis and certain other infectious diseases showed a decrease for the reported year, though deaths from other causes has caused the rate to increase, thus pointing out the necessity of carrying health work into new fields.

Fortunately this Province escaped the epidemic of infant paralysis which swept over the eastern part of the continent last summer, only twelve cases being reported as against 19 for the previous year. It is worthy of citing the report in this instance. Commenting on the seriousness of this epidemic, the report states "Serious as the epidemic of infantile paralysis has been, it has created an interest and demand for preventive action, which is quite disproportionate to its real importance. This is not so regrettable as the fact that other conditions, which are not occasional, but are constantly amongst us, are looked upon with such unconcern." The Provincial Health Officer has in mind the ravages committed by tuberculosis and diseases of early infancy, which has caused no little concern in this district. Though the death-rate from pulmonary tuberculosis has been cut down from a rate of 1.97 per 1,000 in 1911 to 1.30 per 1,000 in 1915, the death-rate from other forms of tuberculosis was reported as exceptionally high. In 1915 there were recorded 92 deaths as due to epidemic cerebro-spinal meningitis. Also 86 deaths were attributed to tubercular meningitis and 57 to simple meningitis, which deaths possibly were due to epidemic cerebro-spinal meningitis, diagnostic distinction being difficult. Morbidity reporting in this instance is most unsatisfactory. A virulent type of measles prevailed in the Province during the recorded

year, 2,680 cases being reported. The actual number of cases was undoubtedly higher, since many returns gave no indication of numbers. A high mortality rate developed, due somewhat to complication, in many instances, with broncho-pneumonia. Typhoid fever, though still much too common, has been decreased in its incidence fully 25 per cent. from the previous year. During the recorded period, 260 cases were reported. During 1914–1915 there were 59 deaths from typhoid in the Province.

The chief problem which this Province must consider is that of infant welfare and the control of diseases of early infancy. In Halifax alone, where the birth registration is probably complete, the infant mortality rate is more than double that of New York City or most any other American city, namely 203 per 1,000 living births. For the cities and towns of this Province there is a general infant mortality rate of 158.4, with a maximum reached by the town of Hantsport of 222.2. Fortunately the rural communities, with a rate of 83.4, bring down the general infant mortality rate for the entire Province to 117.4. It further appears that in some cities and towns the rate for the last several years has been increasing. It is believed that the badly supervised milk supplies of the cities are largely to blame for this excessive rate, though, too, wretched housing conditions and poverty are believed to be a powerful contributing factor. The recently enacted Workmen's Compensation Act and Town Planning Act will greatly improve the existing conditions. Certain towns and cities have adopted drastic Milk By-Laws, and it is hoped that by energetic supervision the infant death-rate will be diminished.

One of the most important amendments suggested by the Provincial Health Officer, Dr. W. H. Hattie, is that the appointment of medical health officers be for more than a period of one year. At present it is the custom of many of the town and city councils to make a new appointment each year. Such a frequent change of office personnel cannot obviously preserve efficiency of the departments.

It is probable from the report of the bacteriological laboratory that many of the physicians of the Province are not taking advantage of the undoubted assistance to be obtained from it, though it is pleasing to note that the samples submitted have increased over the previous year and that new sections of the Province are being heard from.

As willing as is this great British colony to sacrifice itself for the victorious ending of this Great War, and hence to give first consideration to the means whereby victory can be brought about, Doctor Hattie's comment that "it is regrettable that so little thought should be given to the fact that the sacrifice of life on the battlefield constitutes a very special need for the saving of life at home" is well deserved and should be understood as a word of warning to all concerned.

Public Health Notes.

Public Comfort Stations.—W. R. Howe, writing in *Good Health* for July, 1917, emphasizes the need of public comfort stations and their importance as a factor in the health of a community. Too often the saloon and other questionable places are the only form of comfort available to touring parties and to other people who do not know of whatever private facilities may be known to citizens of the community.

There is an indirect influence upon the health through moral contamination when such places are frequented in search of public comfort. There is also the more direct influence that goes with restraining the processes of Nature to the point of suffering. This cannot be done without great harm to the body, not only because it injures the system, but also because it paves the way for constipation and all the evils that follow in its train.

No little care should be exercised in locating these stations. The mistake should not be made of regarding them as a thing to be kept out of sight, and to be modest about.

Every community, no matter how small, should give this important matter the attention which it deserves.

Expectant Mothers in Munition Factories.—The *Medical Officer* for June 23, 1917, prints some conclusions which the French *Académie* has reached in connection with the employment of married women in industries, particularly in munition factories.

Prospective or nursing mothers should be given work requiring only moderate effort in form and duration. Work exposing the women to slow or abrupt traumatism, and to fatigue and insufficient sleep should be prohibited. A six hour day should be the maximum for these workers, and night work should not be permitted. During the last four weeks of pregnancy, the mother should not be permitted to work. A physician should be available for consultation in the factory at all times, and a woman superintendent should look after the hygiene of the women workers. Provision should be made for factory women to suckle their own babes. The pregnant or suckling mother who is compelled to stop her work should be remunerated by the state. Unless it is absolutely necessary, it is recommended that mothers should not be employed industrially.

Sanitary Control of Bathing Beaches.—In the June number of the *Ohio Public Health Journal*, W. H. Dittoe points out the necessity for supervising bathing beaches which have come so much into public favor.

The replies received from thirty-eight state health departments show that such bathing places are not supervised or controlled. Twelve of the states claim that typhoid fever and other intestinal diseases are known to have been transmitted in bathing at the public beaches.

Not only is it necessary that the water used for bathing should be of drinking quality, but every effort should be made to prevent pollution of these waters by discharging sewers or the wastes from the houses on the shore. Contamination of the waters by the bathers themselves should be minimized. Adequate toilet facilities should be provided in the bath-houses, likewise a sufficient supply of safe drinking water. Means should also be provided for sterilizing suits and towels used by the bathers.

Garbage Analysis and Food Conservation.—An editorial in the *Journal of the Florida Medical Association* for July, 1917, urges the analysis of city garbage from week to week as an index of food saving or waste. Where there is no official chemist, local chemists can render great service to the nation by volunteering to make these analyses in their localities.

The usual garbage reduction or disposal methods waste and lose vast amounts of valuable foodstuff for animals. Dual collection of garbage and trash should be rigidly enforced, and greater use should be made of the garbage as animal food.

The American garbage pail receives too much edible material and it is believed that if the thrift idea is properly furthered, this amount may be reduced to an extent which will make reduction methods hardly worth while.

The people must face the facts and know the truth of their waste, and in bringing this waste home local chemists can render effective service.

This suggestion originated in the United States Department of Agriculture.

To Sterilize Milk Containers.—"To assist milk producers to reduce their losses from milk which sours in transit and to help them comply with bacterial requirements set by local health officers, the Dairy Division of the United States Department of Agriculture this coming season will demonstrate its home-made steam sterilizer for dairy utensils in a large number of milk-producing centers. Already the health authorities in 150 cities have asked the department to send these outfits for local demonstration.

"These outfits the department has offered to lend any local dairy official or health officer who will agree to demonstrate them in actual practice to milk producers in his locality. The outfits, which cost not over $15 and can be made by any local tinsmith, when placed on a range or a two-burner oil stove, generate steam enough to kill the bacteria in milk cans, pails, strainer cloths and separator parts. At the same time the device removes foul odors, leaves the utensils dry as well as sterilized, and adds materially to their life.

"Those interested in the subject can obtain Farmer's Bulletin 748 on application to the department."

This note was taken from *The Creamery and Milk Plant Monthly* for March, 1917.

New York Milk Committee.—The report for 1907–1916 summarizes the work that has been accomplished. The committee is interested in reducing the infant mortality rate in New York City, and in safeguarding the city's milk supply. During the past ten years, the infant mortality rate for New York City was reduced from 153 to 93 per thousand population.

Following are, in the main, the results accomplished.

The value of infant milk stations was established after careful experiments had been tried in selected and congested districts. Their educational value was demonstrated. Instruction in the home was attempted by visiting nurses with great success. The value of these experiments was so apparent, that New York City soon established 55 similar stations.

The committee proved that clean milk can be produced and sold at a price demanded for milk of uncertain quality. Routine laboratory control of the milk supply was urged. The value of prenatal care was demonstrated with 3,000 expectant mothers. A district health center was established in New York City in 1913, and its value demonstrated. Efforts have been made to control and eliminate bovine tuberculosis among dairy herds. Legislative bills that attempted to lower the standards for a safe milk supply were vigorously opposed. Surveys, reports, and investigations were made. Educational literature was distributed and other methods were employed to educate the people to a full appreciation of the value of a safe milk supply.

✤

Fatigue and the Aged.—In the *New York Medical Journal*, Dr. A. L. Fish speaks of nervous and muscular fatigue and their effect on the aged.

When a muscle does work, the carbohydrate in the tissue is decomposed to form lactic acid, creatine and carbon dioxide. These substances are toxic and inhibit further contraction. When the muscles are flushed through the blood vessels by defibrinated blood or a weak salt solution, the fatigue products are removed. Fatigue products are acid in character, whereas the normal muscle in repose is alkaline.

The functions of the body are affected first in the circulation and respiration, and later in the digestion and the action of the kidneys.

In the case of individuals advanced in age, the tissues are more or less in a state of chronic fatigue, due to the wear and tear of the past years. Any added burden to the tissues produces fatigue products out of all proportion, and the result may be fatal.

✤

Food Allowances for Healthy Children.—Miss Lucy Gillett of the N. Y. A. I. C. P. has studied this important subject and has reached certain conclusions which are recorded below.

It has been customary heretofore in estimating the food requirements of children to base these figures on the food allowance for a man. The food requirement of any individual depends on the age, size and activity of the individual in question. Hence the food requirement of any person should be based on these factors, and not on the requirements of a normal healthy man.

It is apparent that an adequate food allowance must not only provide energy for internal and external activities, but must support the increase in weight of a growing body.

The following table shows the food allowances for normal children. The limits given permit of individual variations in each city.

Food Allowances for Children.

Age in years.	*Calories per day.*	
	Boys.	*Girls.*
Under 2	900–1,200	900–1,200
2–3	1,000–1,300	980–1,280
3–4	1,100–1,400	1,060–1,360
4–5	1,200–1,500	1,140–1,440
5–6	1,300–1,600	1,220–1,520
6–7	1,400–1,700	1,300–1,600
7–8	1,500–1,800	1,380–1,680
8–9	1,600–1,900	1,460–1,760
9–10	1,700–2,000	1,550–1,850
10–11	1,900–2,200	1,650–1,950
11–12	2,100–2,400	1,750–2,050
12–13	2,300–2,700	1,850–2,150
13–14	2,500–2,900	1,950–2,250
14–15	2,600–3,100	2,050–2,350
15–16	2,700–3,300	2,150–2,450
16–17	2,700–3,400	2,250–2,550

From the above table, the food requirements of an entire family may be determined, knowing the age, size and occupation of each member.

Public Health Clippings.

The Butcher's Lament.

The meat inspector is mine enemy, I shall not like him.

He maketh me to shoo out the flies and cover the sausage mill.

He showeth me the meat I shall sell, and that I shall not.

Yea, verily, tho' I scrub the ice box twice yearly, he sayeth it is not clean.

He kicketh if I keep hogs in the backyard and sayeth it is unsanitary.

He smelleth of my sausage and heaveth it in the slop barrel, even tho' it be but slightly sour.

He demandeth that I use not the larynx and mammae for sausage.

And he speaks in harsh tones if I disobey him.

I bring my meat to his office for inspection, wrapped in tree tops.

He turneth it down and insists that I wrap it in clean, white cloths.

Yea, verily, tho' mine hog grew up in mine own orchard, he condemneth it for cholera and fly-blows, and I lose twelve dollars and a half.

He hurls threats at me if I bring not the livers and "lights," and if I am slow about paying my bill at the month's end he maketh me bring the money at the time of inspection.

He anointeth my livers with kerosene and insisteth on seeing the hides and earmarks even tho' I tell him there is none.

Surely the words "Clean up and stay clean" will be hurled at me all the days of my life, and I shall live in fear of the inspector for ever and ever. Amen.—*Public Health* (Michigan) from *Mulford Vet. Bulletin.*

✻

Who is Benefited by Public Health Work? The path of the health official is at best a dreary one. He must often, if not always, lead in measures which are distasteful sometimes to everyone in the community, even though in the interest of those who are antagonistic. A successful campaign to make the water supply of a city or town wholesome, an effort which may save the lives of a number of people is rewarded often by the publicly expressed opinion that "we have been drinking that water for years and no one died from it" or "water that was good enough for my father is good enough for me." It cannot be proved perhaps that "no one died from the water" yet it may be morally certain that they did.

The public would like to see in returns of dollars and cents the good accomplished by the health official, but it is the duty of this official to conserve and protect, that the public may have health, not sickness, and promotion of health is not to be measured in financial terms.

If, through patient and persistent work of the health officer, the death rate of a community is lowered, frequently it is not noticed by those most interested.—*Louisiana State Board of Health.*

✻

The Roller Towel.

"Roll on, thou stiff and dark old towel—roll!
A hundred hands are wiped on thee each day;
Thou bearest mystic records, like a scroll,
And finger prints of all who passed thy way;
And where be those that said thou shouldst not stay,
The New York traveling men who bade thee hence,
The Kansas people, who did sternly say,
'Each his own towel—count not the expense,'
They pass—but thou still roll'st thy length immense."—*Judge.*

✻

Do You Know That Insanity costs every inhabitant in the United States $1 per year?

Untreated pellagra ends in insanity?—Boston *Monthly Bulletin.*

✻

Don't Dope the Baby with Paregoric.—Among the baby killers there is nothing so deadly as dope. In some households it is the custom to keep paregoric on hand for an emergency. Some mothers are thoughtless and careless enough to dope their babies with this drug whenever they cry. Occasionally a mother is so heartless and even criminal that she will dope her baby to make it sleep while she works or goes calling.

Paregoric contains opium, and babies are very

susceptible to opium or its alkaloids, the chief of which are codein, heroin, and morphine. Careless dosing with such drugs has sometimes killed babies or led to other very serious consequences. Among other ill effects, opiates profoundly affect the digestive processes by retarding the secretion of digestive fluids. A baby's digestion is too important a function to be tampered with in this fashion. Perfect health, often even life itself, depends upon an unimpaired digestion.—North Carolina *Health Bulletin*.

Hygienic Sinners.

The waitress who carries a napkin under her arm and wipes off your plate with it.

The fruit stand owner who exhales on your apple and polishes it on his sleeve before he sells it to you.

The good old doc who still believes there ain't no such things as germs.

The cook who tastes from the pot and stirs with the tasting spoon.

The employer who does not supply adequate sanitary facilities for his help.

The street car conductor who holds the transfer slips in his mouth.

The restaurant toothpick.

The roller towel.

The barber who uses a styptic pencil.

The milkman who takes the temperature of the milk with his finger.—Cumberland *Health Bulletin*, partly from *Jour. A. M. A.*

Buddeized Milk.—Many German scientists who object to the pasteurization of milk in the belief that the process causes deterioration of the milk and renders it injurious to babies, now endorse a new method of manipulating milk which is known as "buddeizing." The process was introduced in Germany, and before the war, had been taken up in the Baltic provinces of Russia and in other parts of Northern European countries. By the "buddeizing" process milk is heated only to 122 degrees F., a small amount of peroxide of hydrogen being added before the heating. The peroxide is entirely evaporated in the heating and the germs are destroyed more completely, it is claimed, than by pasteurization, and no deterioration of the milk is caused. —*Bulletin*, Pennsylvania Department of Agriculture.

Flygrams.

It is a short haul from the garbage can to the dining table via the fly route.

It is better to screen the cradle and wear a smile than scoff at the precautions and wear mourning.

Flies in the dining-room usually precede nurses in the sick room.

Screen windows and prevent crêpe on the door.

A fly in the milk may mean a member of the family in the grave.

It costs less to buy a screen door than to get sick and lay off for a month.

Flies are a disgrace. They indicate nearby filth.

No filth, no flies, fewer flies, fewer dead babies.

How long will you continue to let the fly eat at your table?

Get the flies before they get you.

Lice are accidents, fleas are a nuisance, bedbugs are a disgrace but flies are a householder's own fault.

Do not buy fruit, meat, groceries, etc., where flies are tolerated. If the flies beat you to it, let them have it.

The fly is a home wrecker. Destroy it.

When the fly comes in the window, good health goes out the door.

If man were as persistent as the fly, there would soon be no flies.

If at first you don't succeed, swat, swat again. —Cumberland (Maryland) *Health Bulletin*.

Life Lines.

Swat the fly!
It carries germs upon its feet.
It wipes them off on food we eat,
And on the baby's lips so sweet,
Which makes her die; and that is why
We swat the fly—
The hateful, horrid, deadly fly!
—Cumberland *Health Bulletin*.

Some Health Sayings.

Public health is public wealth.—*Franklin*.

In the health of the people lies the strength of the nation.—*Gladstone*.

The care of the public health is the first duty of the statesman.—*Disraeli*.

Industrial Hygiene and Sanitation.

Miners' Consumption has been the subject of a study by A. J. Lanza of the U. S. P. H. S. The results of the study are contained in Public Health Bulletin No. 85 (U. S. P. H. S.). Four hundred and thirty-three cases of miners' consumption among zinc miners in southwestern Missouri came under close observation. It was found that miners' consumption is widely prevalent among the hard rock miners of the Joplin district, affecting probably 30 to 35 per cent. of them. The consumption is essentially a pneumoconiosis. The disability and other effects of miners' consumption are due primarily to silicosis, infection being usually a secondary, and often a terminal process. The incidence of tubercle infection in miners' consumption is a menace to public health, affording an unusual opportunity for the spread of tuberculosis. It is of great importance to improve the working conditions of the miners, and to carry on an intelligent educational campaign. The Roentgen-ray studies required in the course of the investigation were made by Dr. S. B. Childs.

*

Dependents of Enlisted Men.—Details pertaining to the "Care of Dependents of Enlisted Men in Canada" are available in Publication No. 25 of the U. S. Department of Labor, Children's Bureau. The pamphlet was prepared by Mr. V. S. Herbert Wolfe of New York, who visited Canada for that purpose. Mr. Wolfe discusses especially public provisions.

*

Welfare Work in British Munition Factories.—This bulletin (U. S. Dept. of Labor, Bureau of Labor Statistics, No. 222) is the second of a group of bulletins to be published by the Bureau of Labor Statistics of the U. S. Department of Labor in compliance with a resolution voted April 7, 1917, by the Council of National Defense. The Committee considering the problem concluded that "almost more important than the immediate or technical environment in which work is carried on and the length of hours during which the workers are employed," are four chief influences which affect industrial efficiency; namely, questions of housing, transit, canteen, provision, and individual welfare of the employees. Welfare supervision has already been undertaken in a number of munition factories, and testimony of managers is given commending the services rendered by welfare supervisors. Instances of the successful work of women supervisors are mentioned. The committee outlines the duties of welfare supervision in considerable detail. A dietary, containing a sufficient quantity of nutritive material, suitably mixed, easily digestible and obtainable at a reasonable cost, is essential. The establishment of industrial canteens is highly desirable. Those plants which already have such canteens report a marked improvement in the health and physical condition of workers, a reduction of sickness, less absence and broken time, less tendency to alcoholism, increased efficiency, and other mutual benefits. Leonard E. Hill, one of the members of the committee, paid particular attention to the workers' food and an ideal dietary. The minimum canteen diet may be taken to be about 3,000 calories per day. The cost of the meals analyzed ranged from 10.1 cents to 34.5 cents. With reference to washing facilities and baths the committee emphasizes the fact that cleanliness is very beneficial to the health and personal efficiency of workers. Provision should be made for an ample supply of hot and cold water. Baths and lavatories should be kept clean. Their care should be in the hands of an appointed officer acting under the welfare supervisor.

*

Asphyxiation from Blast-Furnace Gas is the title of Technical Paper 106, Bureau of Mines, Department of the Interior, prepared by Frederick H. Willcox. The report discusses the nature and causes of poisoning from blast-furnace gas, itemizes the places where gas may be expected to be encountered, suggests safeguards and points out the precautions to be taken in working about gaseous places.

*

The Michigan Legislature rejected the health insurance bill urged by the American Association for Labor Legislation.

Communications.

To the Editor:

In an article in your June issue entitled "Military Sanitation in the Present War" by Thorndike Saville, C. E., appears the following statement under the heading "Water Purification":

"The British also advocate the use of the self washing filter cone, such as is used at Toronto. Theoretically it is most economical but no results from its use in the army are given and it has not been satisfactory at Toronto."

As the engineers who designed this 60 million Imperial gallon per day water purification plant for the city of Toronto, we have to say that a portion of the plant is now in operation but that no official tests have been made. A 500,000 Imperial gallon per day demonstration plant was built before the larger plant was decided upon and thoroughly tested by the city of Toronto bacteriologists with absolutely satisfactory results in every respect as will be observed from the Report attached covering these official tests.

Under these conditions the statement quoted above in reference to the Toronto plant is without foundation, absolutely unwarranted, as well as being false. Such a sweeping and damaging statement as contained in the article cannot possibly be based on facts. What object the writer had in view can best be left to the imagination.

We are not in a position to make reference to the results obtained from the filters used for war purposes further than to indicate that we continue to construct same for many of the Allied Powers.

Yours very truly,

JOHN VERMEHR ENGINEERING COMPANY, LTD.,
WILLIAM STORRIE,
Chief Engineer.

To the Editor:

I beg to acknowledge your courtesy in giving me opportunity to reply to the letter of Mr. William Storrie, Chief Engineer of the John verMehr Co., Ltd., in which he takes exception to certain statements appearing in my article "Military Sanitation in the Present War."

The statement to which Mr. Storrie takes exception came to me from what I considered a most authoritative source, although as I remember the matter was only referred to conversationally. As my informant is now absent from the country, I am unable to verify my understanding of the statement. The only assertion from which Mr. Storrie apparently has grounds for dissenting is found in the last few words, that "it has not been satisfactory at Toronto." Authority for this statement was not based on personal knowledge of the conditions, and as Mr. Storrie states that no official tests have been made, undoubted injustice has been done, although in an entirely unintentional manner.

Under these circumstances I am very glad to have my article corrected, and trust that you will find opportunity to publish this letter in an early issue of the JOURNAL.

Yours very truly,

THORNDIKE SAVILLE.

Personal Notes.

Members and subscribers enlisting in the Sanitary Service, or other war divisions, are respectfully requested to inform the Editor, for notice in these columns.

Professor S. M. Gunn, editor of the JOURNAL, has departed for France to become associate director of the Tuberculosis Commission of the International Health Board. Mr. A. W. Hedrich, for the past year editorial assistant, has been appointed acting editor and acting secretary to the Association.

Dr. Elmer S. Tenney of Boston, Mass., formerly of the Army Medical Corps, has accepted the position of health commissioner to the state of Nebraska.

Mr. W. Thurber Fales has been appointed health officer of Glen Ridge, N. J.

Mr. Franz Schneider, Jr., has resigned as sanitarian of the Department of Surveys and Exhibits, Russell Sage Foundation, to become associate health editor of *The Delineator*.

Dr. William L. Holt has been appointed instructor in hygiene and bacteriology in the Medical School of Western Reserve University.

The following have been elected to membership in the American Public Health Association:

Caldwell Woodruff, M. D., Hyattsville, Md., Deputy State Health Officer.

Wilson G. Smillie, M. D., New York City.

Miss Evelyn Peck, New York City, Manager, Department for Social Workers, Intercollegiate Bureau of Occupation.

Mr. L. R. Bartlett, Eastport, Me., Inspector and Bacteriologist, National Canners Association.

Mr. Jules Gagnon, Newburyport, Mass.

Mr. E. D. Reynolds, Danvers, Mass.

Miss Margaret McCluer, Bon Air, Va., Assistant City Bacteriologist of Richmond, Va.

Mr. Frederick E. Church, Milwaukee County Hospital, Wauwatosa, Wis., Assistant Bacteriologist and Pathologist, Milwaukee County Hospital.

Mr. Cassius L. Clay, Louisiana State Board of Health, New Orleans, La., State Analyst, Louisiana State Board of Health.

Miss Norma Burrell, South Haven, Mich., Bacteriologist in charge of Municipal Laboratory for examination of water and milk.

Mr. Herbert L. Wright, Kenosha, Wis., Health Commissioner.

Mr. Henry W. Lehmkuhl, New York City, Pharmaceutical Chemist (Columbia Univ.), Chief of Division of Food Inspection, Bureau of Food and Drugs, Department of Health, City of New York.

Mr. Hermann C. Lythgoe, Boston, Mass., Director, Food and Drug Division, Massachusetts State Department of Health.

Current Public Health Literature.

AMERICAN.

American Food Journal, Chicago.

XII. June.

Care of Confectionery. Walter C. Hughes.
Cold Storage Holdings of Foods.
The Food Manufacturer and the Law. Thomas E. Lannen and Thomas J. Hickey.
Home Canning by the Cold Pack Method.
The Use of Mixed Flour in Making Bread. E. H. S. Bailey and W. S. Long.

XII. July.

Analysis of Canned Salmon.
Food Values of Package Foods.
Food Conservation by the States. A Symposium by State Officials.
Food Wastage in New York. Isaac Russell.
Loss of Iron in Boiling.
Master Bakers Act to Stem Bread Waste.
Rice a Convenient Starchy Food.
Why Bread is Cheaper in France.

American Journal of Nursing, Baltimore.

XVII. June.

State After-Care of Infantile Paralysis. Kate Baker, R. N.

XVII. July.

Health Conditions in Prisons. Thomas M. Osborne.
The Nurse and Infectious Diseases. George W. Goler, M. D.
The Prevention of Diseases of Infants and Children. Ellen C. Babbitt.
How Can the Small Hospital Train Pupils Toward Public Health Nursing? Mary S. Gardner, R. N.
What Will Health Insurance Do for the American Citizen? Miles M. Dawson.
What Will Health Insurance Mean to the Insured? Pauline Newmann.
A Bird's-Eye View of Nursing History. Isabel M. Stewart.

American Medicine, New York.

XXII, No. 6. June.

Poliomyelitis. Editorial.
Industrial Prophylaxis. Editorial.
The Shortage of Nurses. Editorial.
Venereal Prophylaxis. Editorial.
Anthrax, An Occupational Disease. Editorial.
The Successful Management of Scarlet Fever. I. L. Van Zandt, M. D.

Boston Medical and Surgical Journal.

CLXXVI. June 28.

On Cranial Measurements of Persons.
Dying in Insane Hospitals. L. G. Lowrey.
Tetanus in War and Peace. Editorial.

CLXXVII. July 5.

Tuberculosis in the Army. Editorial.

CLXXVII. July 12.

The Control of Cancer of the Massachusetts Medical Society.

The Creamery and Milk Plant Monthly.

V. April.

Digestibility of Cheese.
Milk as a Food.
Cream Grading for Kansas.
The Care of Milk and Its Use in the Home.
Pasteurization of Market Milk.
Milk Topics.
A Report, "Coöperative Dairymen."
City Milk Supply.
Creamery and Milk Plant Ventilation.

V. May.

Controlling the Chemical and Physical Properties of Evaporated Milk.
The Dairy Problem.

Intervals Between Milkings and Their Influence on Milk.
Milk-borne Typhoid Fever.
The Clarification of Milk.
Tentative Standards for Milk Products.
A Controversy About Clarification. Editorial.

Journal of the American Medical Association, Chicago.

LXVII. June 30.

The Hospital Opportunities and Responsibilities to the Syphilitic. H. R. Varney.

LXIX. July 14.

Sanitation in the Trenches. C. C. McCulloch.
The Relative Values of Public Health Procedures. C. V. Chapin.
The Prevention of Endemic Typhus in California. J. G. Cumming and H. F. Senftner.

Journal of Laboratory and Clinical Medicine, St. Louis.

II. July.

The Bacteriology of Poliomyelitis. Horace Greeley.

Journal of Outdoor Life, New York.

XIV. July.

The Cur—A. T. B.'s Story.
The Will and Recovery. Fraser.

Medical Times, New York.

XLV. June.

Tobacco. B. F. Roller.
Tobacco Protein Allergy. Editorial.

The Modern Hospital, St. Louis.

IX. July.

State Care of the Feeble-Minded. J. M. Murdock.
Flavoring Extracts, Their Character and Composition. J. P. Street.
Institutional Economics for War Time.

New York Medical Journal.

CVI. July 14.

A Study of Sixty-Seven Cases of Epidemic Cerebrospinal Meningitis. D. F. Bentley, Jr.
Observation and Inspection in the Physical Examination in Pulmonary Tuberculosis. Charles Rayevsky.
A Special Investigation into the Poliomyelitis Epidemic in New York in 1916. Editorial.
Tuberculosis in the Soldier. Editorial.

CV. June 30.

Summary of the Wassermann Tests Done During 1916 in the Philadelphia General Hospital. R. C. Rosenberger.
The Effects of Fatigue upon the Aged. Arthur L. Fisk.

CVI. July 7.

The Army Medical Service. T. H. Goodwin.
Typhoid Forms in the Italian Army. Editorial.

The Nurse.

June.

The Forsyth Dental Infirmary for Children.
The Mission to Lepers. F. N. Hollingsworth.

Pediatrics.

XXIX. May.

The Cost of Child Labor. Editorial.
The Cow as an Agent of Diphtheria Infection.
Tuberculosis, A Disease of Children. F. C. Moor.

Public Health Reports.

Vol. 32. July 6.

Virulent Smallpox in Douglas, Ariz.
Poliomyelitis Reported in Ohio.
Outbreak of Dysentery in Arkansas.
Sewage Disposal under Rural Conditions.
Anopheles Punctipennis—Ability to Serve as Host for Plasmodium Falciparum.

July 13.

Trachoma and the Army.
Poliomyelitis in Japan.
Experimental Typhus in Guinea Pigs.

July 20.

Medical Care of Injured Federal Employees.
Quarantine Station, Philippine Islands.
Malaria in North Carolina.
Hay Fever in Rocky Mountains and Western States.

July 27.

Meningococcus Carriers—Recognition and Treatment.
Malaria in Louisiana.
Measles, Prevalence in 1916.

Public Health Nurse Quarterly, New York City.

IX. July.

The Public Health Nurse and the After-Care of Infantile Paralysis. Edith Swaine, Agnes M. Sjolund, Clara Johnson.
A Health Center in a Large City. Robert H. Bishop.
Teaching Problems of Public Health Instructors. Anne H. Strong.
Specialized Public Health Nursing. Cecilia A. Evans.
The Solution of Family Problems by Coöperation with other Agencies. Harmina Stokes.

Safety.

V, No. 4. April.

Success in Accident Prevention. Marcus A. Dow.
The Control of Fumes in Industrial Finishing Operations.
Reduction of Coal Mine Fatalities in the United States.

Safety Engineering, New York.

April.

Hazards of Locomotive Engineers. Frederick S. Crum.
Rescue Work at a Montana Mine.

June.

Humidity, Heat and Accidents. H. E. Ingram.
Hygiene, Sanitation and Physical Examinations. Wm. J. Erickson.

Social Hygiene, Baltimore.

III. January.

Clinics for Venereal Diseases, Why We Need Them; How to Develop Them. Wm. F. Snow.
A Health Exhibit for Men. F. J. Osborne.
Prostitution and Alcohol. Walter Clarke.
The Venereal Peril. Isaac W. Brewer.

Survey, New York.

XXXVIII. May 19.

A Red Cross Civilian Relief Plan.
Premature Old Age from the Trenches.
Nationalizing the Public Health.

XXXVIII. May 26.

Iowa's Child Welfare Station.
Tuberculosis Among the Rookies.

Trained Nurse and Hospital Review.

LIX. July.

The Conservation of the World's Teeth. A. New.
Occupation for Crippled Soldiers. Frank B. and Lillian M. Gilbreth.